TM 11-288

TO–30 PRC 16—5

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

RADIO SET AN/PRC-16

DEPARTMENT OF THE ARMY • APRIL 1951

RADIO SET AN/PRC-16

C 2, TM 11-288
TO 16-30PRC16-5

DEPARTMENTS OF THE ARMY AND THE AIR FORCE
WASHINGTON 25, D. C., *24 March 1954*

TM 11-288/TO 16-30PRC16-5, 3 April 1951, is changed as follows:

3. Forms and Records

(Superseded)

The following forms will be used for reporting unsatisfactory conditions of Army materiel and equipment.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745-45-5 (Army) and AFR 71-4 (Air Force).

b. DA Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700-45-5.

c. DD Form 535, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700-45-5 and AFTO 00-35D-54.

d. DA Form 11-238, Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form.

e. Use other forms and records as authorized.

17. Receiver-Transmitter RT-70/GRC Antenna Tuning

(As changed by C 1, 19 Oct 1951)

Receiver-Transmitter RT-70/GRC is * * * particular antenna system.

* * * * *

e. (Added) If the point of adjustment for minimum noise level is too broad, turn the tuning control (TENTH MCS) to slightly below 58 mc until the noise level increases, and then retune the antenna tuning control for minimum noise level. If the antenna adjustment is still too broad, repeat the procedure with the main tuning dial (TENTH MCS) detuned more than previously, until a very definite and sharp quieting point is obtained with the antenna tuning control.

Note. The above procedure * * * may be made.

Table III. Equipment Performance Checklist

Item No.	Unit	Item	Action or condition	Normal indications	Possible troubles or defective units
*	*	*	*	*	* *
12	Receiver-transmitter.	Handset----	Press the push-to-talk * * * to check transmission. If no monitor is available, **connect the terminals of a #331 lamp between the lower end of the antenna and the antenna bracket.**	Sidetone is heard * * * lamp or monitor.	If the lamp * * * circuit is defective.
*	*	*	*	*	* *

[AG 413.44 (4 Oct 51)]

* **These changes supersede C 1, 19 October 1951.**

31.1. Antijamming

(Added)

If the receiver is jammed by an enemy signal, report this condition immediately to your superior officer. *Keep the set in operation.* The enemy may be uncertain as to his jamming success and may discontinue the jamming signal. The desired signal then may be heard again. Continued operation of the transmitter from which the desired signal is being received keeps the enemy in uncertainty as to his jamming success. When the receiver is jammed, follow the procedure described below until signal read-through is reestablished.

a. Slowly vary the TENTH MCS control, first to one side and then to the other side of the assigned frequency. This procedure may provide some read-through.

b. Change the location of the radio set so that some object such as a tree, truck, tank, earth mound, etc. is between the source of the jamming signal and the radio set. If the direction of the source of the jamming signal is unknown, use trial and error methods. This procedure frequently reduces the jamming signal strength.

c. Turn the radio set on its side so that the antenna is horizontal instead of vertical. This may provide some read-through.

d. Remove one antenna section. This may provide read-through.

e. If the jamming action is so complete and effective that alternate frequencies do not permit communication, use some other means of getting the message through.

f. Keep the radio set in operation.

CHAPTER 4.1

PREVENTIVE MAINTENANCE SERVICES

(Added)

45.1. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order so that breakdowns and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from troubleshooting and repair since its object is to prevent certain troubles from occurring. See AR 750–5, Maintenance of Supplies and Equipment, Maintenance Responsibilities and Shop Operation.

45.2. General Preventive Maintenance Techniques

a. Use No. 0000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning.

(1) If necessary, except for electrical contacts, moisten the cloth or brush with Solvent Dry Cleaning (SD); then wipe the parts dry with a cloth.

(2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a dry cloth.

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. Make sure adequate ventilation is provided. Do not use carbon tetrachloride on polyvinyl insulation; it is a solvent for this resin.

c. If available, dry compressed air may be used at a line pressure not exceeding 60 pounds per square inch to remove dust from inaccessible places; be careful however, or mechanical damage from the air blast may result. Do not use the air blast in the vicinity of speaker cones or meter movements.

d. For further information on preventive maintenance techniques, refer to TB SIG 178.

45.3. Use of Preventive Maintenance Form

(fig. 15.1)

a. The decision as to which items on DA Form 11–238 are applicable to this equipment is a tactical decision to be made in the case of first echelon maintenance by the communication officer/chief or his designated representative, and in the case of second and third echelon maintenance, by the individual making the inspection. Instructions for the use of the form appear on the reverse side.

b. Circled items in figure 15.1 are partially or totally applicable to Radio Set AN/PRC–16. References in the ITEM block refer to paragraphs in text which contain additional maintenance information.

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).* PAR. 45.4a							
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 45.4b							
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 45.4c							
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS.							
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 45.4d							
6	CHECK FOR NORMAL OPERATION. PAR. 45.4e							

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 45.4f		13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 45.4g		14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES. PAR. 45.4j	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 45.4h		15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR. 45.4i		16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 45.4k	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.		17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES.		18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.	

19 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION. PAR. 45.4l

DA FORM 1 MAY 51 11-238 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM 288-C2-I

Figure 15.1. DA Form 11-238.

45.4. Performing Exterior Preventive Maintenance

Caution: Tighten screws, bolts, and nuts carefully. Fittings tightened beyond the pressure for which they are designed will become damaged or broken.

a. Check for completeness of equipment; spare parts, instruction books, and accessories.

b. Check to see that location and installation are suitable for normal operation.

c. Remove dirt and moisture from antenna, handset, connectors, carrying bags, and control panels.

d. Inspect all controls on front panels (fig. 1) for binding, scraping, excessive looseness, or misalinement.

e. Check for normal operation (par. 47).

f. Clean the antenna mount and all cable connectors.

g. Inspect all exposed metal surfaces for rust, corrosion, and moisture.

h. Inspect all cables and instruction books for cuts, fraying, and deterioration.

i. Inspect the antenna for eccentricities, corrosion, and loose fit.

j. Clean the dial window and the nameplates.

k. Inspect shelters and covers for adequacy of weatherproofing.

l. If deficiencies noted are not corrected during inspection, indicate on form DA 11–238 the action taken for correction.

[AG 413.44 (2 Mar 54)]

BY ORDER OF THE SECRETARIES OF THE ARMY AND THE AIR FORCE:

M. B. RIDGWAY,
General, United States Army,
Chief of Staff.

OFFICIAL:
WM. E. BERGIN,
Major General, United States Army,
The Adjutant General.

N. F. TWINING,
Chief of Staff, United States Air Force.

OFFICIAL:
K. E. THIEBAUD,
Colonel, United States Air Force,
Air Adjutant General.

DISTRIBUTION:

Active Army:

Tech Svc (1); Tech Svc Bd (1); AFF Bd (ea. Svc Test Sec) (1); AFF (5); AA Comd (2); OS Maj Comd (5); Base Comd (5); MDW (2); Log Comd (5); A (5); CHQ (2); FT (2); Sch (5) except 11 (25); Gen Dep (2); Dep 11 (20) except Sig Sec, Gen Dep (10); Tng Div (2); POE (2), OSD (2); Lab 11 (5); Mil Dist (3); Field Maint Shops 11 (3); Two (2) copies to each of the following T/O & E's: 5–226A; 7–31A; 7–32A; 11–107; 11–127; 11–128; 11–500A, KA, KB, KC, RA through RR; 11–557A; 11–587; 11–592; 11–597.

NG: Same as Active Army except one copy to each unit.

USAR: None.

For explanation of distribution formula, see SR 310–90–1.

U. S. GOVERNMENT PRINTING OFFICE: 1954

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TM 11-288

RADIO SET AN/PRC-16

DEPARTMENT OF THE ARMY • APRIL 1951

United States Government Printing Office

Washington : 1951

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *3 April 1951*

TM 11–288 is published for the information and guidance of all concerned.

[AG 413.44 (27 Mar 51)]

BY ORDER OF THE SECRETARY OF THE ARMY:

OFFICIAL:
EDWARD F. WITSELL
Major General, USA
The Adjutant General

J. LAWTON COLLINS
Chief of Staff, United States Army

DISTRIBUTION:

Tech Svc (2) except 11 (65); Arm & Svc Bd (1); AFF Bd (ea Svc Test Sec) (1); AFF (5); AA Comd (2); OS Maj Comd (5); Base Comd (5); MDW (5); Log Comd (5); A (20); CHQ (2); FC (2); Sch (2) except 11 (25); Gen Dep (2); Dep 11 (20) except Sig Sec, Gen Dep (10); Tng Div (2); PE (10), OSD (2); Lab 11 (5); 4th & 5th Ech Maint Shops 11 (3); Two (2) copies to each of the following T/O & E's: 11–107; 11–127; 11–500 CA, CB, CC, CD; 11–587; 11–592; 11–597; SPECIAL DISTRIBUTION.

For explanation of distribution formula, see SR 310–90–1.

WARNING

HIGH VOLTAGE

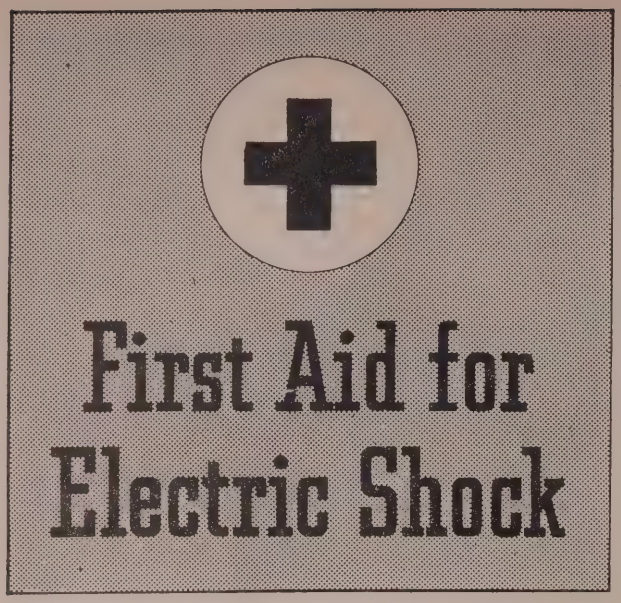
is used in the operation of this equipment

DEATH ON CONTACT

may result if operating personnel fail to observe safety precautions

CONTENTS

	Paragraph	Page
CHAPTER 1. INTRODUCTION		
Section I. General	1–3	1
II. Description and data	4–12	1
CHAPTER 2. INSTALLATION INSTRUCTIONS		
Section I. Installation details	13–16	8
II. Adjustments for operation	17–19	10
CHAPTER 3. OPERATING INSTRUCTIONS.		
Section I. Modes of operation	20–22	12
II. Controls and instruments	23–25	12
III. Preliminary operational procedures	26–29	13
IV. Operation	30–32	15
CHAPTER 4. THEORY OF OPERATION		
Section I. Introduction	33–35	11
II. System circuit details	36–42	18
III. Unit theory	43–45	19
CHAPTER 5. ORGANIZATIONAL MAINTENANCE		
Section I. Trouble shooting	46–47	24
II. Replacement of parts	48–51	24
CHAPTER 6. AUXILIARY EQUIPMENT		
Section I. Control Group AN/GRA–6	52–59	31
II. Chest Set Group AN/GSA–6 and Headset-Microphone H–63/U	60–62	43
CHAPTER 7. SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE		
Section I. Shipment and limited storage	63–64	51
II. Demolition of matériel to prevent enemy use	65–66	52
APPENDIX I. REFERENCES		53
II. IDENTIFICATION TABLE OF PARTS		55
III. RELATED RADIO SETS		58
INDEX		62



First Aid for Electric Shock

RESCUE.

In case of electric shock, shut off the high voltage at once and ground the circuits. If the high voltage cannot be turned off without delay, free the victim from contact with the live conductor as promptly as possible. Avoid direct contact with either the live conductor or the victim's body. Use a dry board, dry clothing, or other nonconductor to free the victim. An ax may be used to cut the high-voltage wire. Use extreme caution to avoid the resulting electric flash.

SYMPTOMS.

a. Breathing stops abruptly in electric shock if the current passes through the breathing center at the base of the brain. If the shock has not been too severe, the breath center recovers after a while and normal breathing is resumed, provided that a sufficient supply of air has been furnished meanwhile by artificial respiration.

b. The victim is usually very white or blue. The pulse is very weak or entirely absent and unconsciousness is complete. Burns are usually present. The victim's body may become rigid or stiff in a very few minutes. This condition is due to the action of electricity and is not to be considered rigor mortis. Artificial respiration must still be given, as several such cases are reported to have recovered. The ordinary and general tests for death should never be accepted.

TREATMENT.

a. Start artificial respiration immediately. At the same time send for a medical officer, if assistance is available. Do not leave the victim unattended. Perform artificial respiration at the scene of the accident, unless the victim's or operator's life is endangered from such action. *In this case only*, remove the victim to another location, but no farther than is necessary for safety. If the new location is more than a few feet away, artificial respiration should be given while the victim is being moved. If the method of transportation prohibits the use of the Shaeffer prone pressure method, other methods of resuscitation may be used. Pressure may be exerted on the front of the victim's diaphragm, or the direct mouth-to-mouth method may be used. Artificial respiration, once started, must be continued, without loss of rhythm.

b. Lay the victim in a prone position, one arm extended directly overhead, and the other arm bent at the elbow so that the back of the hand supports the head. The face should be turned away from the bent elbow so that the nose and mouth are free for breathing.

c. Open the victim's mouth and remove any foreign bodies, such as false teeth, chewing gum, or tobacco. The mouth should remain open, with the tongue extended. Do not permit the victim to draw his tongue back into his mouth or throat.

d. If an assistant is available during resuscitation, he should loosen any tight clothing to permit free circulation of blood and to prevent restriction of breathing. He should see that the victim is kept warm, by applying blankets or other covering, or by applying hot rocks or bricks wrapped in cloth or paper to prevent injury to the victim. The assistant should also be ever watchful to see that the victim does not swallow his tongue. He should continually wipe from the victim's mouth any frothy mucus or saliva that may collect and interfere with respiration.

e. The resuscitating operator should straddle the victim's thighs, or one leg, in such manner that:

(*1*) the operator's arms and thighs will be vertical while applying pressure on the small of the victim's back;

(*2*) the operator's fingers are in a natural position on the victim's back with the little finger lying on the last rib;

(*3*) the heels of the hands rest on either side of the spine as far apart as convenient without allowing the hands to slip off the victim;

(*4*) the operator's elbows are straight and locked.

f. The resuscitation procedure is as follows:

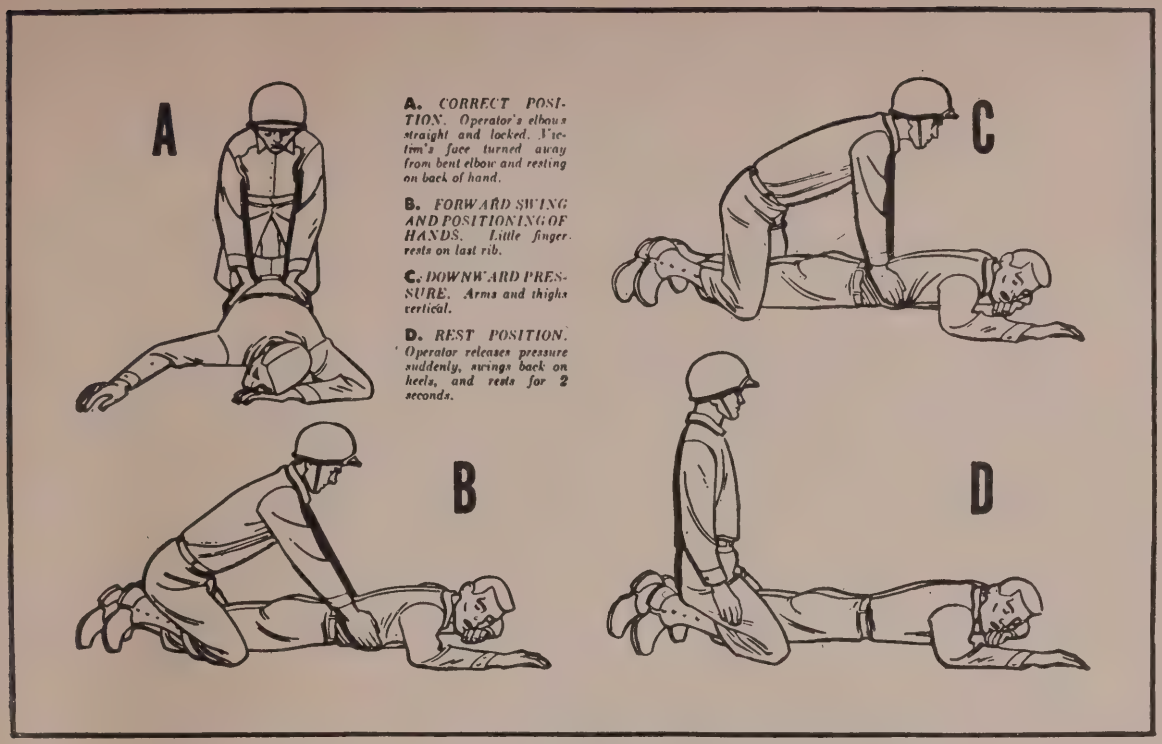
(*1*) Exert downward pressure, not exceeding 60 pounds, for 1 second.

(*2*) Swing back, suddenly releasing pressure, and sit on the heels.

(*3*) After 2 seconds rest, swing forward again, positioning the hands exactly as before, and apply pressure for another second.

g. The forward swing, positioning of the hands, and the downward pressure should be accomplished in one continuous motion, which requires 1 second. The release and backward swing require 1 second. The addition of the 2-second rest makes a total of 4

TL15338-D


A
B
C
D
A. CORRECT POSITION. Operator's elbows straight and locked. Victim's face turned away from bent elbow and resting on back of hand.
B. FORWARD SWING AND POSITIONING OF HANDS. Little finger rests on last rib.
C. DOWNWARD PRESSURE. Arms and thighs vertical.
D. REST POSITION. Operator releases pressure suddenly, swings back on heels, and rests for 2 seconds.

seconds for a complete cycle. Until the operator is thoroughly familiar with the correct cadence of the cycle, he should count the seconds aloud, speaking distinctly and counting evenly in thousands. Example: one thousand and one, one thousand and two, etc.

h. Artificial respiration should be continued until the victim regains normal breathing or is pronounced dead by a medical officer. Since it may be necessary to continue resuscitation for several hours, relief operators should be used if available.

RELIEVING OPERATOR.

The relief operator kneels beside the operator and follows him through several complete cycles. When the relief operator is sure he has the correct rhythm, he places his hands on the operator's hands without applying pressure. This indicates that he is ready to take over. On the backward swing, the operator moves and the relief operator takes his position. The relieved operator follows through several complete cycles to be sure that the new operator has the correct rhythm. He remains alert to take over instantly if the new operator falters or hesitates on the cycle.

STIMULANTS.

a. If an inhalant stimulant is used, such as aromatic spirits of ammonia, the individual administering the stimulant should first test it himself to see how close he can hold the inhalant to his own nostril for comfortable breathing. Be sure that the inhalant is not held any closer to the victim's nostrils, and then for only 1 or 2 seconds every minute.

b. After the victim has regained consciousness, he may be given hot coffee, hot tea, or a glass of water containing ½ teaspoon of aromatic spirits of ammonia. *Do not give any liquids to an unconscious victim.*

CAUTIONS.

a. After the victim revives, keep him LYING QUIETLY. Any injury a person may have received may cause a condition of shock. Shock is present if the victim is pale and has a cold sweat, his pulse is weak and rapid, and his breathing is short and gasping.

b. Keep the victim lying flat on his back, with his head lower than the rest of his body and his hips elevated. Be sure that there is no tight clothing to restrict the free circulation of blood or hinder natural breathing. Keep him warm and quiet.

c. A resuscitated victim must be watched carefully as he may suddenly stop breathing. *Never leave a resuscitated person alone until it is CERTAIN that he is fully conscious and breathing normally.*

TL15338-E

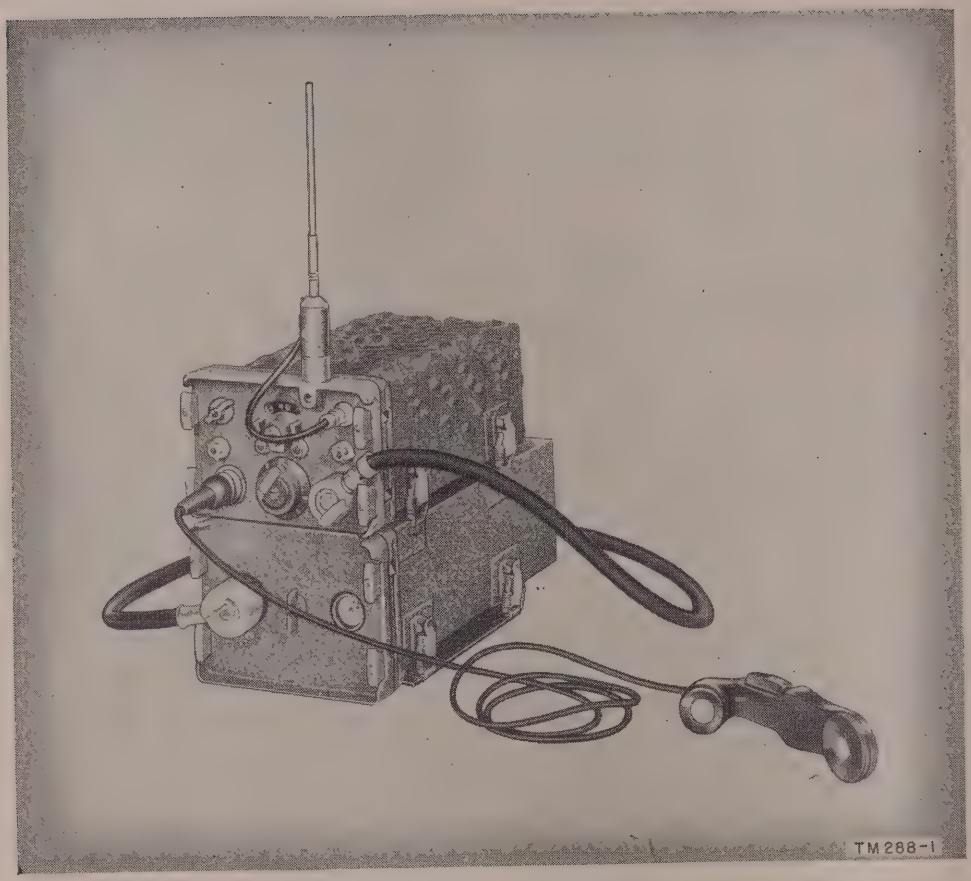


Figure 1. Radio Set AN/PRC–16.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

This technical manual contains instructions for the installation, operation, and organizational maintenance of Radio Set AN/PRC–16. The information is intended primarily for operators and organizational maintenance personnel and, hence, is restricted to system considerations. Detailed information on the receiver-transmitter which is the major unit of the system is presented only to the extent that system applications are involved. Detailed field maintenance instructions for the receiver-transmitter are contained in a separate manual.

2. Nomenclature

To clarify the discussion of Radio Set AN/PRC–16, an arbitrary nomenclature has been devised to refer to the set and its units. This expedient is outlined in paragraphs *a* through *c* below.

a. Receiver-Transmitter RT–70/GRC, which is a unit of Radio Set AN/PRC–16, is often referred to simply as the *receiver-transmitter*. Because it is used in conjunction with other receiver-transmitters in more complex systems, Receiver-Transmitter RT–70/GRC is referred to also as *Set 2* on control unit panels and some schematic diagrams. In Radio Set AN/PRC–16, there is no *Set 1* receiver-transmitter, although panel and schematic references are made to such a set.

b. Case CY–590/GRC, which is another unit of Radio Set AN/PRC–16, is often referred to simply as the *battery box*, because it contains the dry batteries for supplying power to Receiver-Transmitter RT–70/GRC.

c. Control Group AN/GRA–6 (ch. 6), which may be used with Radio Set AN/PRC–16 as auxiliary remote control equipment, is often referred to as the *control group*. To identify the individual control units of the group, Local Control C–434/GRC is often referred to as the *local control* unit, and Remote Control C–433/GRC is often referred to as the *remote control* unit.

3. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army matériel and equipment.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745–45–5.

b. DA AGO Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700–45–5.

c. DA AGO Form 419, Preventive Maintenance Checklist for Signal Corps Equipment, will be prepared in accordance with instructions on the back of the form.

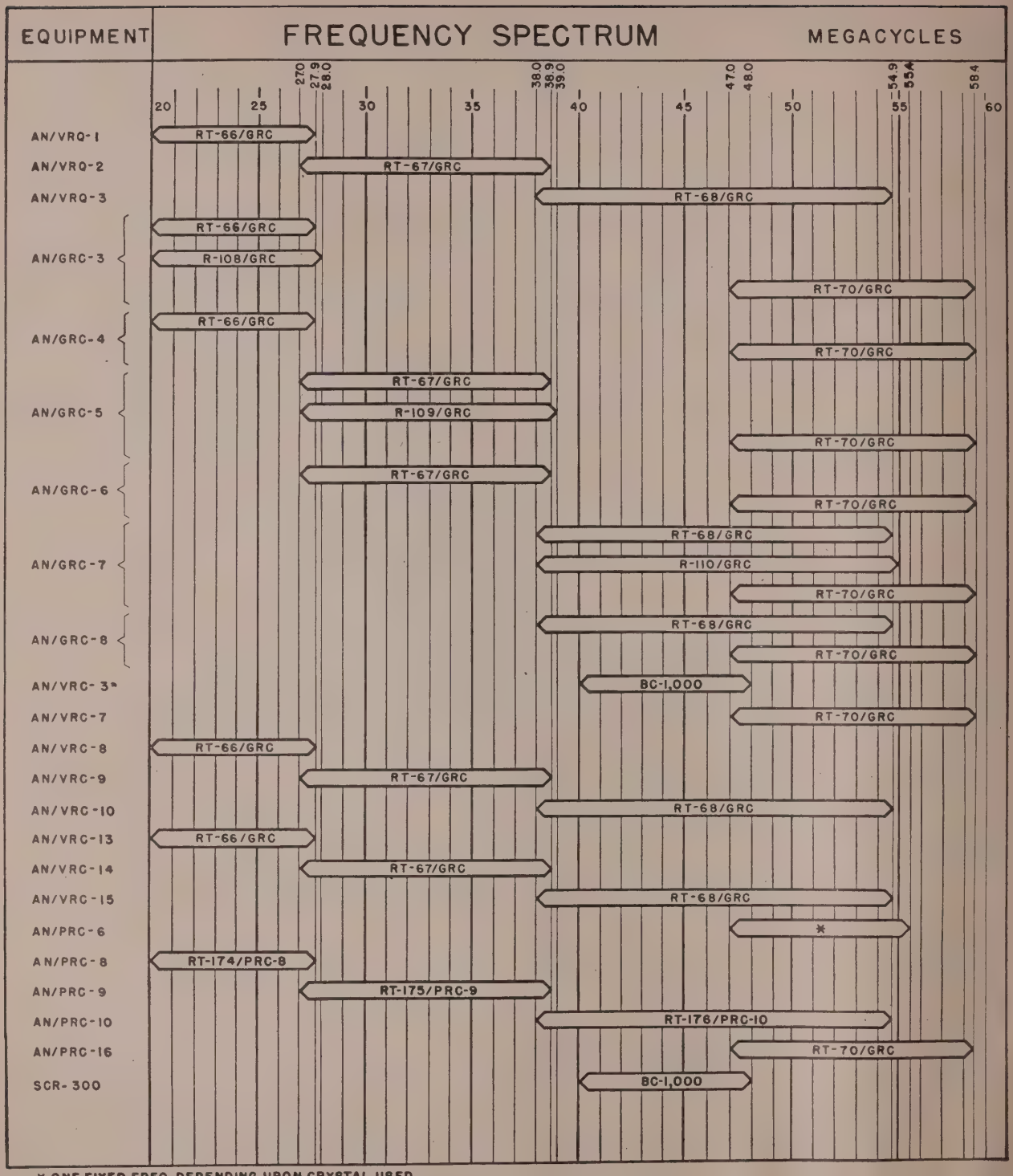
d. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

4. Purpose of Equipment

a. Radio Set AN/PRC–16 is a battery-powered receiver and transmitter set which provides f-m (frequency-modulated) radiotelephone facilities on a push-to-talk basis within the frequency range of 47 to 58.4 mc (megacycles). The frequency range of this set and of other equipment with which this set can communicate is indicated in the frequency spectrum chart (fig. 2). The set is designed primarily for short-range communication (up to 1 mile) between tactical units of ground and/or air force.

b. Radio Set AN/PRC–16 can be used in port-



* ONE FIXED FREQ. DEPENDING UPON CRYSTAL USED.

TM 289-56

Figure 2. Frequency spectrum chart.

able or fixed installations. Listed below are some of the more common applications:

(1) Aircraft communication equipment.
(2) Pack set equipment.
(3) Emergency field equipment.

5. Technical Characteristics

Type of transmission and reception.	F-m signals.
Frequency range	47 to 58.4 mc.
Type of tuning	Continuous tuning with detent provisions for preselection of any two frequencies.
Operational facilities	Monitoring, push-to-talk operation.
Communication range	Approximately 1 mile.
Power drain	90 volts at 80 ma (milliamperes) for plates and screens, 6.3 volts at 360 ma for filaments, and 6.3 volts at 160 ma for transmit relay.
Transmitter r-f (radio-frequency) power output.	Approximately 50 mw (milliwatts).
Receiver a-f (audio-frequency) power output.	Approximately 75 mw.
Audio output impedance	600 ohms.
Receiver bandwidth	Approximately 80 kc (kilocycles), 6 db (decibels) down; 120 kc, 20 db down; not over 180 kc, 40 db down.
Receiver sensitivity	30-db signal plus noise-to-noise noise ratio with ½-uv (microvolt) input signal.

6. Table of Components

a. A table of components for Radio Set AN/PRC–16 is shown in table I. This table lists the basic items which make up Radio Set AN/PRC–16, regardless of the type or conditions of installation. For specific installations, additional equipment may be necessary. This information can be obtained by referring to the specific installation instruction manuals.

b. In addition to the equipment included in the table of components the following dry cells are required for installation in Case CY–590/GRC.

(1) Five 1.5-volt Batteries BA–403/U.
(2) One 90-volt Battery BA–419/U.

7. Packaging Data

The components of Radio Set AN/PRC–16 (par. 6) are packed for shipment in a single wooden box. The components are first individually wrapped in moisture-vaporproof containers and then packed in the box. The contents of the box are listed in table II.

Note. The exact packaging arrangement will depend on the supply channels.

Table II. Packing box contents.

Box No.	Item	Quantity
1	Receiver-Transmitter RT–70/GRC	1 ea
	Case CY–590/GRC	1 ea
	Mounting MT–673/UR	2 ea
	Mounting MT–652/GR	1 ea
	Mast Section AB–22/GR	2 ea
	Mast Section AB–24/GR	2 ea
	Power Cable Assembly CX–1209/U	1 ea
	Handset H–33/PT	1 ea
	Technical Manual (TM 11–288)	2 ea

Table I. Table of components

Component	Quantity	Dimensions of components				
		Height (in.)	Depth (in.)	Length (in.)	Volume (cu. ft.)	Unit weight (lb.)
Mast Section AB–22/GR	2	----------	----------	23. 5	0. 04	1. 36
Mast Section AB–24/GR	2	----------	----------	23. 5	. 005	. 13
Receiver-Transmitter RT–70/GRC	1	4¾	13	7⅞	. 31	25
Mounting MT–673/UR	2	7 1/16	----------	7¼	----------	2. 06
Case CY–590/GRC	1	5½	8	15¾	. 4	7
Technical Manual (TM 11–288)	1	8	¼	10	. 08	1
Mounting MT–652/GR	1	----------	(dia.) 1	6	. 06	. 25
Power Cable Assembly CX–1209/U	1	----------	----------	(ft.) 6	----------	3. 5
Hanset H–33/PT	1	3	2 1/16	3	. 03	2

Note.—Control Group AN/GRA–6 may be supplied as auxiliary equipment for installations requiring remote control facilities.

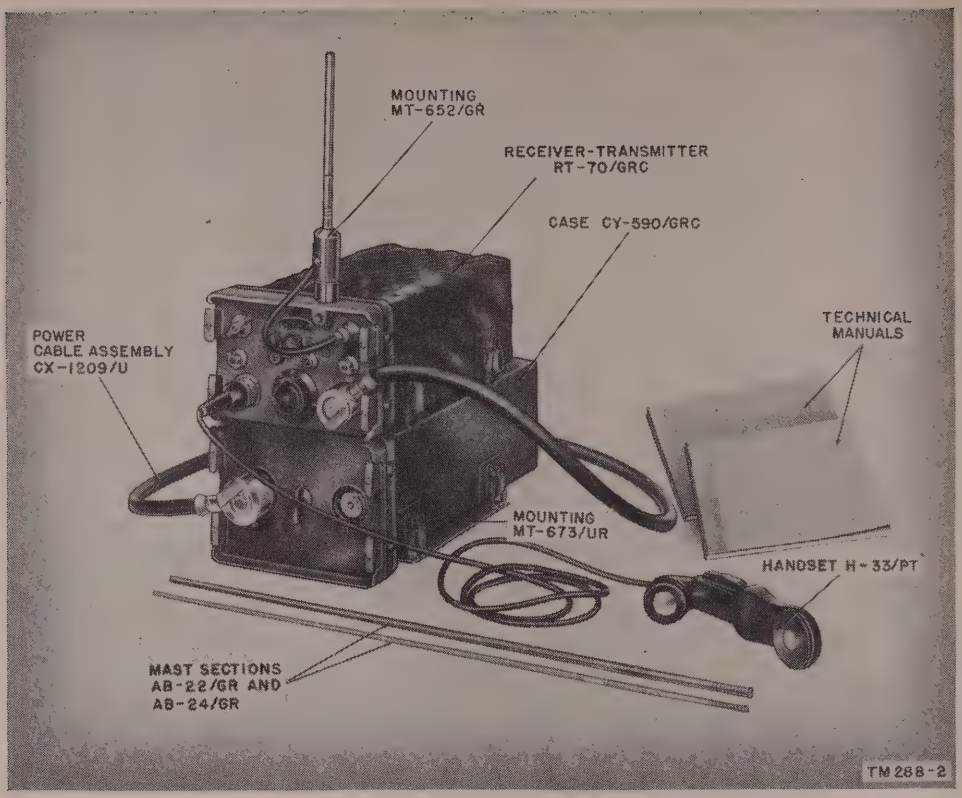


Figure 3. Components of Radio Set AN/PRC–16.

8. General System Description
(figs. 1 and 3)

a. Radio Set AN/PRC–16 includes a receiver-transmitter, a battery box, an antenna system, an interconnecting cable and a handset (fig. 3). The nomenclature outlined in paragraph 2 and the listing of components (table I) will help in the understanding of the following descriptions.

b. Figure 1 shows the major components of Radio Set AN/PRC–16 connected to simulate an operating installation. Receiver-Transmitter RT–70/GRC and Case CY–590/GRC are secured one above the other on a single Mounting MT–673/UR. It is also possible to secure Receiver-Transmitter RT–70/GRC on one mounting and Case CY–590/GRC on another. A connection is made, through Power Cable Assembly CX–1209/U, from the receiver-transmitter to the battery box.

9. Receiver-Transmitter RT–70/GRC
(fig. 4)

a. Receiver-Transmitter RT–70/GRC is a small lightweight radio set sometimes referred to as Set 2 (par. 2). A complete description is given in a separate technical manual. Characteristics pertinent to system operation are listed in paragraph 5.

b. Electrically, the unit consists of a double-conversion type, superheterodyne f-m receiver and an f-m transmitter linked through a common antenna circuit. Turning is continuous over a range of 47 to 58.4 mc; a detent mechanism is provided for presetting any two frequencies (par. 29). Both receiver and transmitter are tuned simultaneously by one control.

c. Physically, the receiver-transmitter is a panel-chassis assembly contained in a metal case. Snap catches are provided on the case for securing it to Case CY–590/GRC (fig. 5) or to Mounting MT–673/UR (fig. 7). When the case is removed (figs. 17, 18, and 19), the r-f and i-f (intermediate-frequency) chassis assemblies are exposed. All tubes are mounted on these vertical chassis.

10. Case CY–590/GRC
(fig. 5)

a. Case CY–590/GRC is a battery box which can hold five 1.5-volt Batteries BA–403/U con-

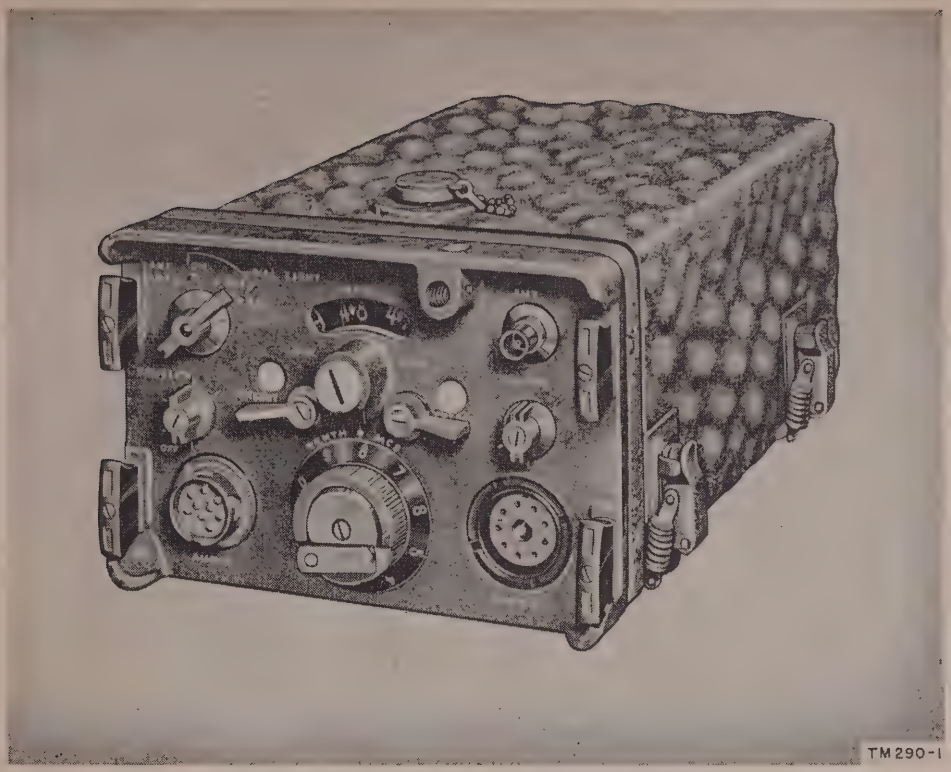


Figure 4. Receiver-Transmitter RT–70/GRC.

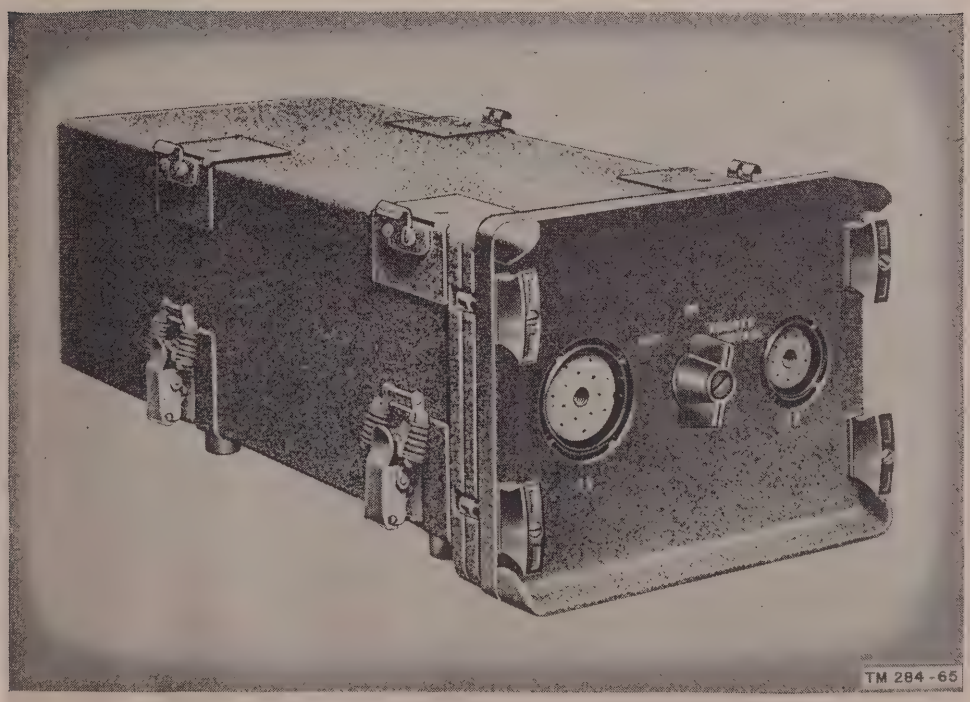


Figure 5. Case CY–590/GRC, front view.

nected in series and one 90-volt Battery BA–419/U. These batteries do not come with the battery case and must be procured separately.

b. Electrically, the unit provides the circuits for supplying the proper operating potentials for the l-v (low-voltage) and h-v (high-voltage) circuits of the receiver-transmitter. Panel-mounted receptacles for connection of the battery circuits to the receiver-transmitter and a power on-off switch for the set are provided.

c. Physically, the battery box is a panel-chassis assembly contained in a metal case. Snap catches are provided on the case for securing the battery box to Mounting MT–673/UR. Keepers are also provided to permit mounting of the receiver-transmitter on top of the battery box.

11. Minor Components

a. The following minor components are used with Radio Set AN/PRC–16:

(1) Mounting MT–673/UR.
(2) Mounting MT–652/GR.
(3) Power Cable Assembly CX–1209/U.
(4) Handset H–33/PT.
(5) Mast Sections AB–22/GR and AB–24/GR.

b. Mounting MT–673/UR is a metal mounting base designed to hold the components of Radio Set AN/PRC–16 (fig. 7). Four recessed holes on the mounting position the cylindrical mounting feet of the battery box or the receiver-transmitter. Riveted to the base are four keepers which engage the snap fasteners of the units. Four metal standoffs are welded to the base to raise the equipment above the rivets.

c. Mounting MT–652/GR is used to hold the antenna masts. Two holes, at right angles to each other, permit attaching the antenna mounting to the receiver-transmitter by means of Dzus fasteners in either one of two positions. The position used will be determined by the circumstances encountered in individual installations. When the mounting is secured, the mast sections can be screwed into the mounting. A rubber-covered lead-in cable, which is part of the mounting, is used to connect the antenna to the ANT post on the receiver-transmitter.

d. Power Cable Assembly CX–1209/U is used to connect the receiver-transmitter to the battery box. It is equipped with multiconnectors at each end to mate with the receptacles on Case CY–590/GRC and the POWER receptacle on the receiver-transmitter.

e. Handset H–33/PT (fig. 6) is a combination microphone and receiver with a push-to-talk switch and a connecting cord and plug. The microphone impedance is 40 ohms; the receiver impedance is 300 ohms. The push-to-talk button is a nonlocking DPST (double-pole, single-throw) switch. The cord is 5 feet long and is terminated in a 10-pin plug which will mate with the AUDIO receptacle on the receiver-transmitter.

f. Mast Sections AB–22/GR and AB–24/GR are approximately 23 inches long and they can fit into each other. When assembled, these mast sections fit into Mounting MT–652/GR to provide a suitable antenna for Radio Set AN/PRC–16.

12. Running Spares

a. The following spare parts are supplied with Receiver-Transmitter RT–70/GRC:

1 lamp, incandescent, 1.35-volt, .06-ampere.

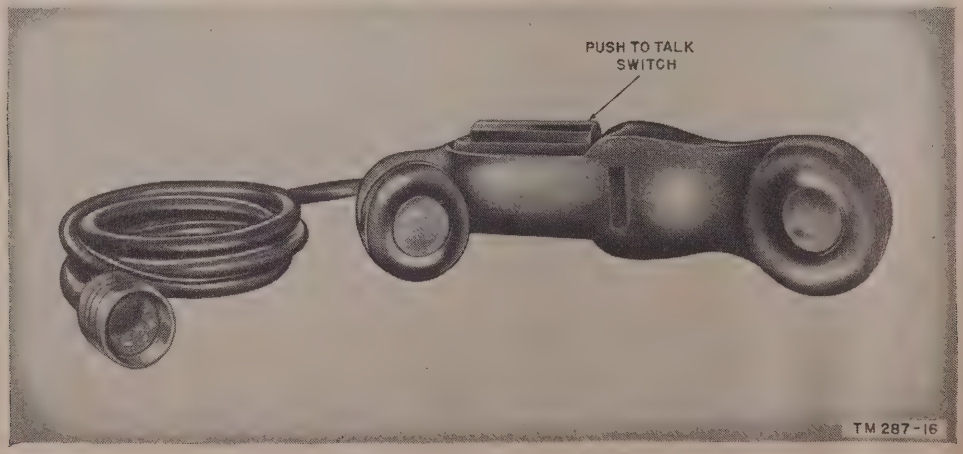


Figure 6. Handset H–33/PT.

1 tube, electron, type 1AE4.
2 tubes, electron, type 1L4.
2 tubes, electron, type 1R5.
1 tube, electron, type 1R5.
10 tubes, electron, type 1U4.
2 tubes, electron, type 3A5.
1 tube, electron, type 3B4.
6 tubes, electron, type 3Q4.

b. There are no spare parts provided with Case CY–590/GRC. However, it is advisable to procure reserve sets of batteries for this unit.

c. The following spare mast sections are provided for Radio Set AN/PRC–16.

1 Mast Section AB–22/GR.
1 Mast Section AB–24/GR.

CHAPTER 2

INSTALLATION INSTRUCTIONS

Section I. INSTALLATION DETAILS

13. General

The flexibility of arrangement provided by Radio Set AN/PRC–16 makes it applicable under a variety of conditions. The instructions in this chapter are limited to the two basic installation arrangements, namely, vertical and horizontal (fig. 37). The arrangement used and the method of installing the mounting will be determined in each instance by the conditions encountered. Two identical mounting units, Mountings MT–673/UR, are supplied to provide for the basic installation arrangements. Mounting MT–673/UR is shown in figure 7.

14. Unpacking Instructions

Take the usual precautions against damage to equipment during the unpacking procedure. The following points should be observed in unpacking Radio Set AN/PRC–16 whenever possible.

a. If auxiliary components are supplied in a separate box, unpack one box at a time and check its contents against the master packing slip.

b. Use cutters to clip metal bands.

c. Do not pry off the top or sides of boxes; use a nail puller to remove the nails and lift off the sides and/or the tops of the boxes.

d. Save boxes, containers, and other packaging material, if practicable, for future use for storage or reshipment.

15. Vertical Installation

A vertical installation is one in which the receiver-transmitter is fastened on top of the battery box. With this type of installation, only one of the mountings is required. The additional mounting should be stored in a convenient place for possible future use. Follow the instructions listed below:

a. Install five 1.5-volt Batteries BA–403/U in series and one 90-volt Battery BA–419/U in Case CY–590/GRC. Proceed as follows:

(1) Remove the immersionproof case (par. 49).

(2) Raise the back plate fastener to partially disengage the back plate from the battery tray chassis. The back plate should then be tilted back on its hinged base (fig. 8).

(3) Place the batteries in the tray (fig. 9) and insert the battery plugs.

(4) Reverse steps (2) and (1) above to reassemble.

b. Place the battery box, Case CY–590/GRC, on the mounting so that the cylindrical mounting posts on the bottom of the battery box set in the recesses on the mounting. Turn the OFF-ON-REMOTE CONTROL switch to the OFF position.

c. Fasten the battery box to the mounting by means of the snap fasteners and keepers attached to the two units.

d. Remove the immersionproof case of Receiver-Transmitter RT–70/GRC (par. 49) and check that the FIELD-VEH-TANK switch is in the FIELD position.

e. Place the receiver-transmitter on top of the battery box, so that the mounting feet on the bottom of the receiver-transmitter set in the recesses on the top of the battery box.

f. Fasten the receiver-transmitter to the battery box by means of the snap fasteners and keepers attached to the two units.

g. Connect Power Cable Assembly CX–1209/U between the receiver-transmitter and the battery box as shown on figure 3.

h. Insert Mounting MT–652/GR in the horizontal or vertical opening of the flange on the receiver-transmitter panel, as required by the spe-

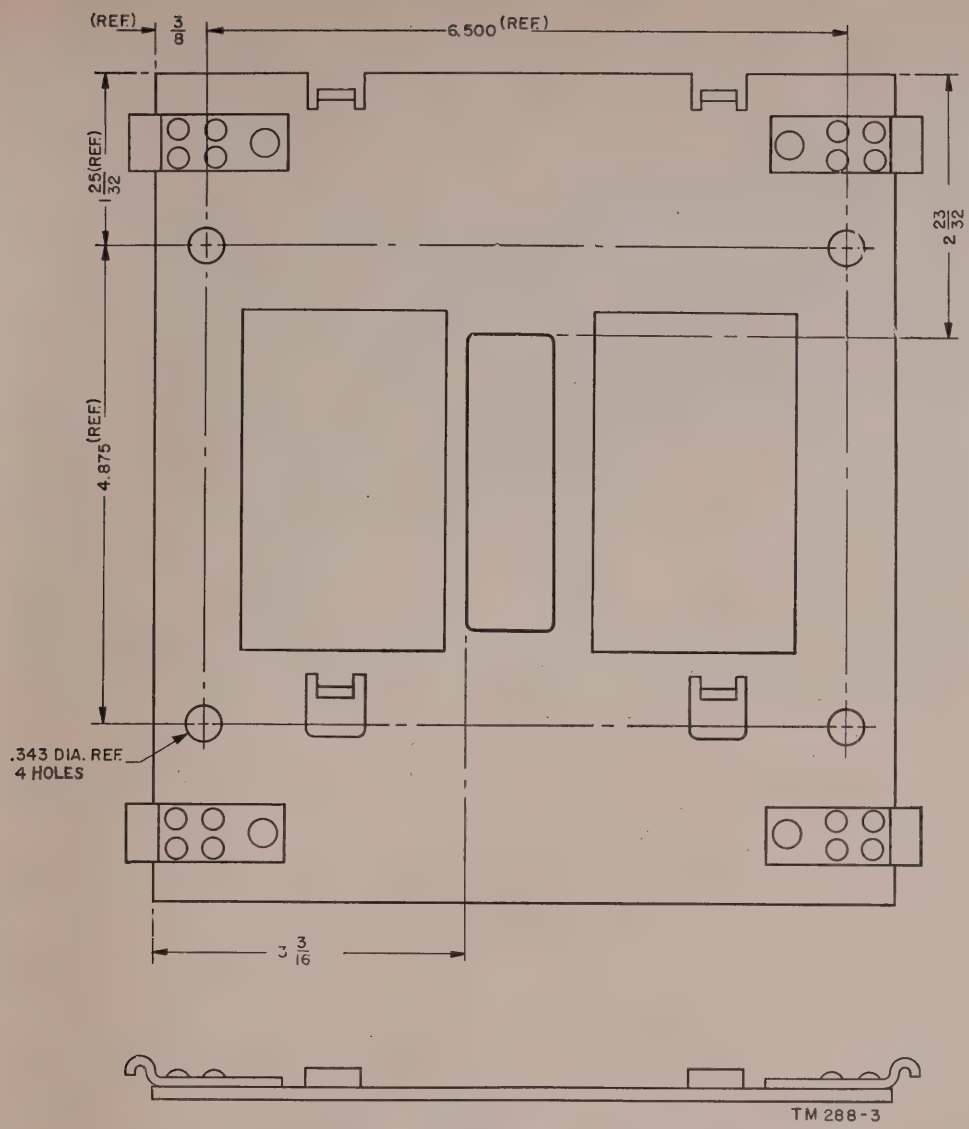


Figure 7. Mounting MT–673/UR, outline dimensions.

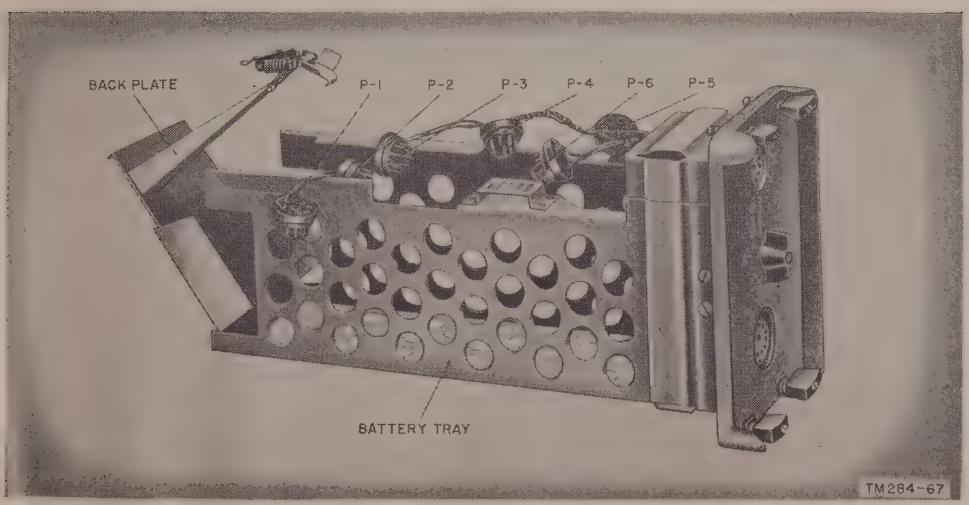


Figure 8. Case CY–590/GRC, case and batteries removed.

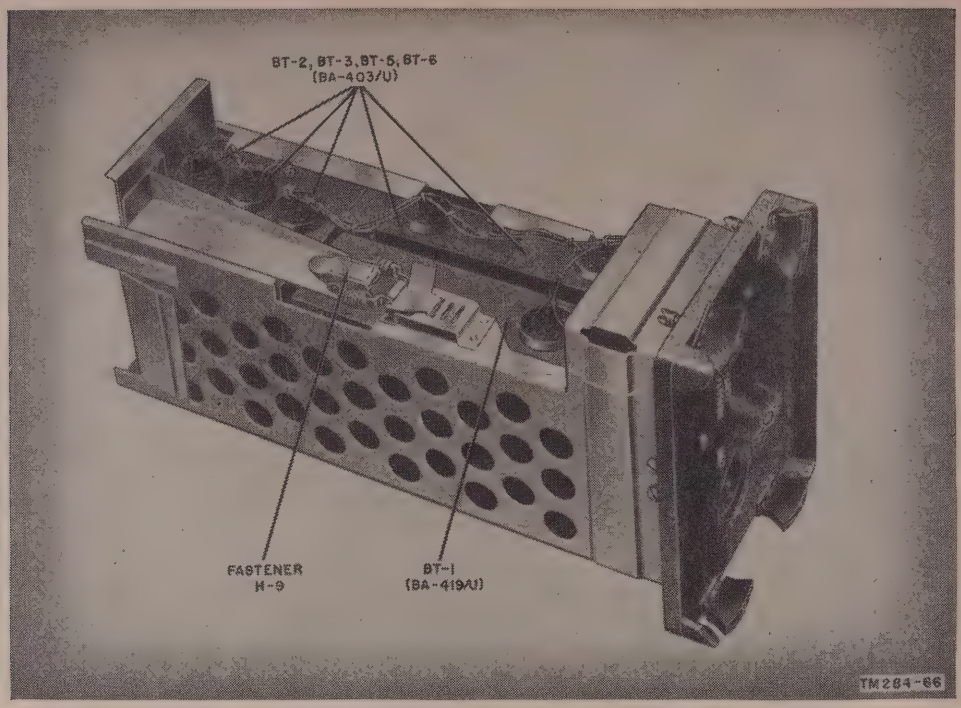


Figure 9. Case CY–590/GRC, case removed, batteries installed.

cific installation, and lock in place by turning clockwise.

i. Assemble the mast sections and screw the assembly into the mounting.

j. Attach the cable from Mounting MT–652/GR to the ANT connector on the receiver-transmitter panel.

k. Connect Handset H–33/PT to the AUDIO receptacle (fig. 10) on the receiver-transmitter by means of the handset connector cable.

16. Horizontal Installation

A horizonal installation is one in which the receiver-transmitter and battery box are mounted separately. With this type of installation, both of the supplied mountings are used.

a. Install the batteries in Case CY–590/GRC as described in paragraph 15*a*.

b. Attach the mounting units to the surface or base to be used.

c. Mount the battery box and the receiver-transmitter on separate mountings as described in paragraphs 15*b* through 15*e*.

d. Connect the receiver-transmitter to the battery box by means of Power Cable Assembly CX–1209/U.

e. Install the antenna mount and mast sections as described in paragraphs 15*h* through 15*j*.

f. Connect the handset as described in paragraph 15*k*.

Section II. ADJUSTMENTS FOR OPERATION

Note. Personnel who are to perform the procedures described in this section should be familiar with the use of controls and instruments and with the operating procedures described in chapter 3.

17. Receiver-Transmitter RT–70/GRC Antenna Tuning

Receiver-Transmitter RT–70/GRC is shipped completely alined, but the antenna circuit must be tuned when the set is connected to a particular antenna system.

a. Perform steps 1 through 8 of the equipment performance checklist (par. 47). Leave the receiver in an operating condition.

b. Calibrate the receiver-transmitter at 58 mc (par. 28).

c. Remove the cap which covers the antenna tuning control (fig. 4) on the top of the receiver-transmitter case.

d. Insert an insulated screw driver or alinement tool through the opening in the case to engage the screw-driver slot of the antenna tuning control. Hold the ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch (fig. 10) in the ANT ADJ position and adjust the tuning control for a minimum noise in the handset earpiece. If necessary, turn down the level of noise by means of the VOLUME control.

Note. The above procedure provides a broad adjustment. If it is possible to obtain a weak signal from an external source (in place of the internal signal), a finer adjustment may be made.

18. Operational Check

When the receiver-transmitter has been tuned, make a complete operational check of the system by performing the procedure outlined in the equipment performance checklist (par. 47). If abnormal indications are obtained, it will be necessary to trouble shoot the system. When required, follow the trouble-shooting suggestions contained in the checklist.

19. Storage of Equipment Not in Use

Equipment not required immediately for operation, such as running spares, extra audio accessories, or Mounting MT–673/UR, should be packed in the containers provided and stored in a convenient location.

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. MODES OF OPERATION

20. General

a. Radio Set AN/PRC–16 provides for monitoring and the reception and transmission of messages on a push-to-talk basis. Handset H–33/PT is connected to the AUDIO receptacle to make these functions possible.

b. When Control Group AN/GRA–6 (auxiliary equipment) is used, the operational facilities can be extended to a remote control location (ch. 6).

21. Monitoring

Monitoring consists of listening to a received radio signal without making an attempt to communicate with the sending station. The output of the receiver is monitored by means of the handset connected to the receiver AUDIO receptacle.

22. Push-to-talk Operation

In push-to-talk operation, the equipment is normally in the stand-by or receiving condition, and pressing the push-to-talk button on an audio device (Handset H–33/PT) disables the receiver and turns on the transmitter. Communication is possible in one direction at a time and it is impossible for the receiving party to *break in* on the sending party.

Section II. CONTROLS AND INSTRUMENTS

23. General

The discussion of controls and instruments is limited to those controls appearing on the panels of Receiver-Transmitter RT–70/GRC and Case CY–590/GRC.

24. Receiver-Transmitter RT–70/GRC

The controls and instruments mounted on the panel of Receiver-Transmitter RT–70/GRC are illustrated in figure 10. Their functions are listed in the following chart.

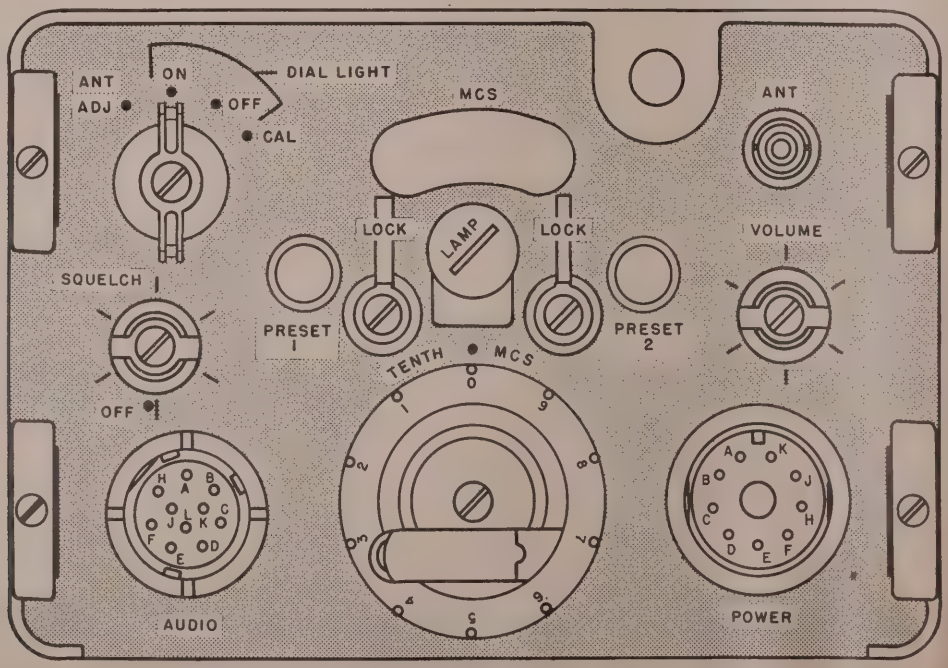


Figure 10. Receiver-Transmitter RT–70/GRC, panel view. TM290-9

Control or instrument	Function
MCS dial and TENTH MCS tuning control.	MCS dial: Calibrations are in megacycles from 47 to 58 and indicate the integral portion of the operating frequency. TENTH MCS tuning control: Selects the operating frequency. The integral portion of the selected frequency is indicated on the MCS dial; the decimal portion of the selected frequency is indicated by the .1-mc calibrations on the tuning control.
PRESET 1 and PRESET 2 levers.	Provide means of presetting any two frequencies (par. 29).
Dial LAMP (E–201).	Illuminates tuning dial and tuning knob except when dial light switch (below) is in DIAL LIGHT-OFF position.
ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch (S–202).	Controls antenna-tuning, dial light, and calibrating circuits. ANT ADJ: Turns on test signal for tuning antenna; turns on dial LAMP: switch is spring loaded to return to DIAL LIGHT-ON position. DIAL LIGHT-ON: Turns on dial LAMP. DIAL LIGHT-OFF: Turns off dial LAMP. CAL: Turns on test signals for calibrating tuning dial (par. 28); switch is spring loaded to return to DIAL LIGHT-OFF position.
Antenna tuning control (C–41).	Provides means of tuning receiver-transmitter antenna circuits. (Internal control accessible through the top of the case when protective cap (fig. 4) is removed; not an operational control.)
VOLUME control (R–204).	Adjusts the receiver audio-output level.
SQUELCH control (R–202 and S–201).	Controls noise suppression and determines what minimum level of input signal will be required for receiver operation. In OFF position it provides for no noise suppression and allows receiver to operate at maximum sensitivity.
AUDIO connector (J–202).	Provides means for connecting a chest set (with headset-microphone), a headset, a microphone, or a speaker for separate local monitoring or push-to-talk operation of the receiver-transmitter. Also used for the connection of the local control unit of Control Group AN/GRA–6 (ch. 6).

25. Case CY–590/GRC

The control on Case CY–590/GRC is illustrated in figure 11. Functions of the control are listed in the following chart.

Control	Function
OFF-ON-REMOTE CONTROL switch (S–1).	Controls power application to the receiver-transmitter. If control group AN/GRA–6 is used, power application facilities can be extended to a remote point. OFF: Breaks the ground connection for the battery circuit. ON: Completes the ground connection for the battery circuit. REMOTE CONTROL: Provides for remote control of power application by making or breaking the ground connection of the battery circuit.

Section III. PRELIMINARY OPERATIONAL PROCEDURES

26. Starting Procedure

Apply power to the receiver-transmitter by turning the OFF-ON-REMOTE CONTROL switch on the battery case to the ON position. If the set is to be operated from a remote location by means of Control Group AN/GRA–6, the function of applying power may be placed under the control of the remote operator's push-to-talk switch by placing the above switch in remote control position.

27. Squelch and Volume-level Adjustments

The SQUELCH and VOLUME controls of the receiver-transmitter should be set as soon as the equipment is placed in operation. The SQUELCH control setting should be checked periodically to insure operation at maximum sensitivity for the particular noise condition present. Set the controls as outlined below.

a. With the VOLUME control set at a low level, turn the SQUELCH control counterclockwise until noise is audible in the handset.

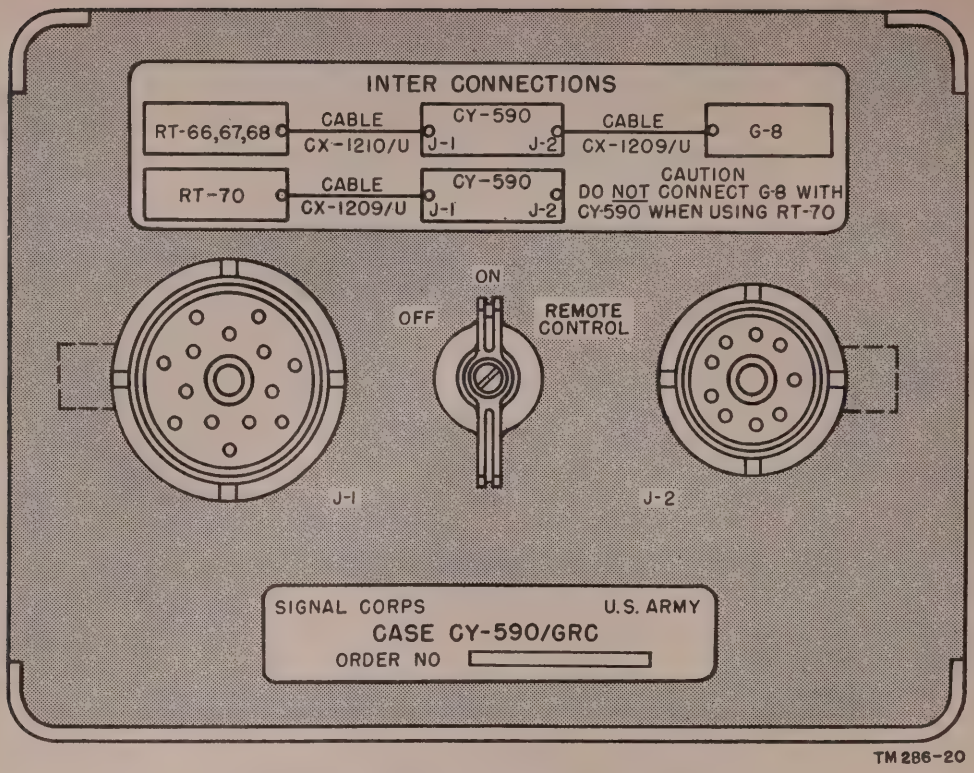


Figure 11. Case CY–590/GRC, front panel

b. Advance the VOLUME control to obtain a comfortable listening level in the handset.

c. Advance the SQUELCH control in a clockwise direction to the point at which the receiver quiets.

28. Tuning Receiver-Transmitter RT–70/GRC

When frequency selections are made, the tuning dial of the receiver-transmitter should always be calibrated at the nearest mc calibration. When power has been applied and the SQUELCH and VOLUME adjustments are completed, perform the following steps:

a. Turn the TENTH MCS tuning control until the integral mc calibration nearest the desired frequency is indicated on the MCS dial.

b. Turn the SQUELCH control to OFF to obtain noise output in the headset.

c. Hold the ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch in the CAL position and listen for a beat note or zero-beat indication in the headset. Adjust the TENTH MCS tuning control slightly, until the zero-beat indication is obtained. The zero beat is an indication that the receiver-transmitter is tuned to the integral mc indicated on the MCS dial.

Note. Unless you are sure the calibration is off do not perform this step as it will cause an unnecessary battery drain.

d. If the zero calibration of the dial on the TENTH MCS control is not exactly opposite the index line on the panel, hold the control and adjust the calibration plate manually until the dial calibration and panel index are in line.

e. Turn the TENTH MCS tuning control to obtain the exact frequency desired. Each calibration is .1 mc.

29. Presetting

a. General. The two locking levers designated PRESET 1 and PRESET 2 on the panel of the receiver-transmitter (fig. 10) may be used to preset (detent) any two frequencies. When the frequencies have been preset as outlined below, they may be selected rapidly by turning the TENTH MCS control until the desired detent is engaged. The two locking mechanisms are independent of each other and may be preset individually.

b. Initial Setting. To preset any two frequencies initially, perform the following steps.

(1) Release the two preset levers by turning each of them to the horizontal position.
(2) Turn the TENTH MCS control over its entire range (from one end to the other) before selecting the desired frequency. Calibrate and tune the receiver-transmitter to one of the desired frequencies.
(3) Turn one of the preset levers to the vertical (LOCK) position. Mark the preset frequency on the label next to the lever.
(4) Calibrate and tune the receiver-transmitter to the second desired frequency.
(5) Turn the second preset lever to the vertical (LOCK) position and mark the preset frequency on the label next to the lever.

Note. To permit identification of a lever control with the frequency to which it is preset, this information should be entered on the associated label.

c. Changing Preset Frequencies. When it is desired to change the frequency which a preset lever controls, perform the following steps:

(1) Turn the TENTH MCS control until the original preset frequency is engaged.
(2) Remove the detent by turning the associated lever (PRESET 1 or PRESET 2 as indicated on the marker) to the horizontal position.
(3) Calibrate and tune the receiver-transmitter to the new frequency and return the preset lever to the LOCK position. It is not necessary to sweep across the dial (par. *b* (2) above) if the preset lever is unlocked while the dial is set at the preset frequency.

Section IV. OPERATION

30. Operational Procedures

a. Operation of the radio set involves the following procedures:

(1) Starting operations.
(2) Squelch adjustments.
(3) Volume-level adjustments.
(4) Frequency selection.
(5) Monitoring and push-to-talk operation.
(6) Stopping procedures.

b. The first four of the above procedures are considered preliminary operational procedures and are covered in paragraphs 26, through 29. They are not necessarily repeated, though repeat tuning and squelch adjustments may be required as occasion demands. The set is normally operated completely from the panel. For remote control operation of the set refer to chapter 6.

31. Monitoring and Push-to-talk Operation

The handset connected to the receiver-transmitter AUDIO receptacle is used for monitoring and push-to-talk operation.

a. The receiver signals will be audible in the handset when the receiver is operative. To vary the signal level in the handset, adjust the VOLUME control on the receiver-transmitter panel.

b. For push-to-talk operation of the receiver-transmitter, press the push-to-talk button on the handset and talk into the mouthpiece. Release the push-to-talk button to listen.

32. Stopping Procedure

To remove power from the radio set, place the OFF-ON-REMOTE CONTROL switch on Case CY–590/GRC in the OFF position.

CHAPTER 4

THEORY OF OPERATION

Section I. INTRODUCTION

33. Scope

a. System theory is presented to provide an understanding of how the components of Radio Set AN/PRC–16 are interrelated in various operations of the radio set. Such an understanding is an effective aid in trouble shooting the equipment to isolate a defective unit, and, in some cases, to isolate a defective part within a unit.

b. Most of the information presented in this chapter is concerned only with system application of the component units. For example, the control circuits of the radio set are described, since they are the basic elements of the operation of the system. Details of the receiver-transmitter i-f amplifier are not important for the understanding of the system and therefore are not discussed. Complete details on the receiver-transmitter are printed in a separate technical manual. To provide a general acquaintance with Receiver-Transmitter RT–70/GRC, however, a block diagram of the unit (fig. 13) is supplied in this chapter. In addition, schematic diagrams of this and the other components of the radio set are included in this manual (figs. 15, 30, 31, 32, and 35).

34. Basic System Block Diagram (fig. 12)

a. The basic elements of Radio Set AN/PRC–16, and their association with each other to form an operating radio set, are illustrated in the simplified system block diagram. Receiver-Transmitter RT–70/GRC, the major component of the set, provides the transmitting and receiving circuits, as well as the control circuits necessary for push-to-talk operation. The microphone with push-to-talk switch, the headset, the battery power supply (Case CY–590/GRC), the antenna, interconnecting cable, and the mounting are provided to make it possible for Receiver-Transmitter

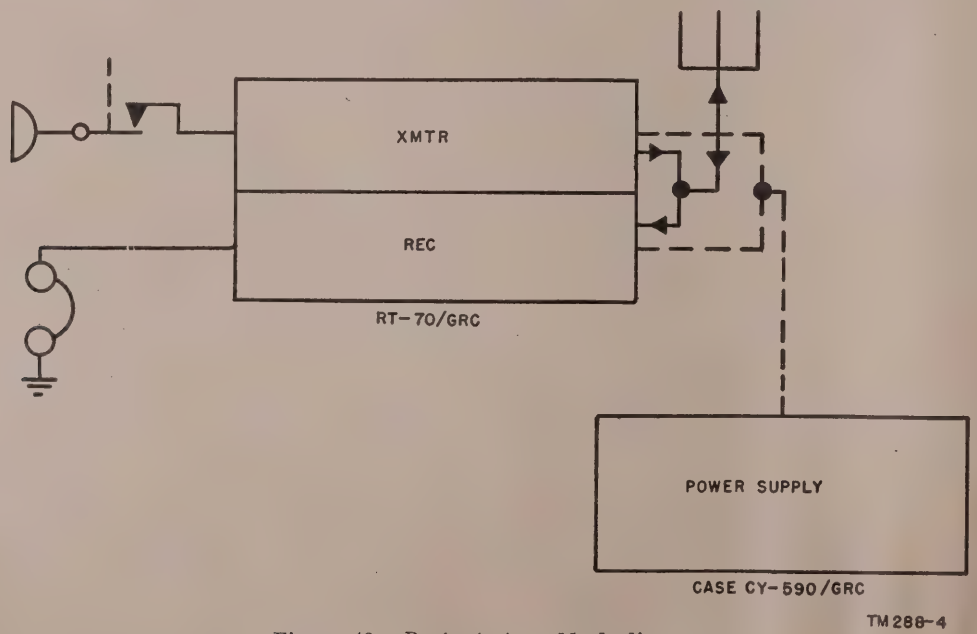


Figure 12. Basic system, block diagram.

RT–70/GRC to perform its functions of transmission and reception.

b. Dry batteries installed in Case CY–590/GRC provide power for the receiver-transmitter. An interconnecting cable (Power Cable Assembly CX–1209/U) routes the plate, filament, microphone, and control relay potentials from Case CY–590/GRC through a panel connector on the receiver-transmitter to the power circuits within that unit.

c. Radio Set AN/PRC–16 operates on a push-to-talk basis. This means that normally the receiver is operative and in stand-by condition, ready to receive a message. The transmitter, however, is normally inoperative. Operation of the push-to-talk switch on the audio accessory (microphone, handset, or chest set, whichever is used) effectively disables the receiver, and fully energizes the transmitter in preparation for the transmission of a message.

d. The push-to-talk switch on the audio accessory is thus the main operational element of the set, since it places in the hands of the operator the means of selection of the mode of operation of the radio set, namely, transmission or reception. For this purpose, the microphone input, receiver audio output, and push-to-talk control circuits within the receiver-transmitter are extended from the receiver-transmitter panel to the push-to-talk switch via the cable and connector assembly associated with the particular audio accessory used.

35. System Diagram and Legend

(fig. 36)

Figure 36 illustrates the interconnections and functioning of parts and circuits of Radio Set AN/PRC–16. Power distribution, control circuits, and other operational elements are shown in detail. Signal transmission paths within Receiver-Transmitter RT–70/GRC are indicated by reference only, except where a particular section of the signal path is directly associated with a power distribution or control function. The signal transmission paths of the receiver-transmitter are shown in the block diagram (fig. 13) and in the detailed schematic diagram (fig. 35). A system legend and a set of grid coordinates, provided in figure 36 as an aid in circuit tracing, are described in paragraphs *a* and *b* below.

a. The system legend has been devised as an aid to circuit tracing from unit to unit. Because the circuits are often completed through more than one unit, and similar reference symbols are used within each unit, the legend is necessary. A letter has been used to identify each unit; a letter, dash, and number to identify each part; and a number or letter to identify the terminals and pins. Thus in the reference symbol C/J–203J at the top left-hand corner of figure 36, C indicates Receiver-Transmitter RT–70/GRC, J–203 is the reference symbol for a receptacle on the receiver-transmitter, and J indicates terminal J of that receptacle. Interconnection of Z/P–2J and C/J–203J indicates that the circuit is completed to the receiver-transmitter through pin J of plug P–2 of the Power Cable Assembly CX–1209/U. The complete legend, as shown in figure 36, is listed below:

Legend

Unit symbol	Unit symbolized
C	Receiver-Transmitter RT–70/GRC
M	Remote Control C–433/GRC
N	Local Control C–434/GRC
S	Case CY–590/GRC
T	Handset H–33/PT
Z	Power Cable Assembly CX–1209/U

b. To aid in the location of parts discussed in the text, the system diagram incorporates a set of grid coordinates similar to that used on maps. When a part is referred to, the grid-coordinate letter and number are included in parentheses after the part symbol. Through use of these coordinates the reader can readily locate the part on the diagram. For example, to locate section 1A rear of switch C/S–202 (G,03) on the diagram (fig. 36):

(1) Find the coordinate letter G on the left- or right-hand margin.
(2) Find the coordinate number 03 at the top or bottom margin of the diagram.
(3) Mentally project straight lines from the two points until the lines intersect. The switch is located near the point of intersection.

36. Power Input

(fig. 36)

Power for operation of Radio Set AN/PRC–16 is derived from a set of dry batteries provided in Case CY–590/GRC (S in fig. 36). Power Cable Assembly CX–1209/U (Z in fig. 36) joins the battery circuits to the l-v and B+ circuits of Receiver-Transmitter RT–70/GRC by linking the power out connector on S to the power in connector on C.

a. Placing the OFF-ON-REMOTE CONTROL switch S/S–1 (F,01) in the ON position completes the ground circuits within Case CY–590/GRC for batteries BT–1 and BT–2 through BT–6. To insure operational stability, the ground in Case CY–590/GRC is connected to the common ground within Receiver-Transmitter RT–70/GRC, through terminal J–1K in the battery box, pins P–1K and P–2D of Power Cable Assembly CX–1209/U, and terminal D of POWER receptacle C/J–203. The ground circuit for the REMOTE CONTROL position of switch S/S–1 is discussed in chapter 6.

b. The battery potentials for the filament, plate, and screen circuits are applied to four terminals of the receiver-transmitter POWER receptacle, C/J–203:

(1) The 7.5-volt potential of batteries BT–2 through BT–6 is applied through dropping resistors S/R–1 and S/R–3 and Power Cable Assembly CX–1209/U to terminals F (E,03) and B (E,04), respectively.

(2) The 90-volt potential of battery BT–1 is applied through Power Cable Assembly CX–1209/U to terminals H (B,01) and J (B,02).

37. Receiver Filaments

(fig. 36)

a. The receiver filament circuits, consisting of three parallel 6-volt strings, are supplied from terminal C/J–203 F (E,03). The filaments of tubes C/V–2, C/V–4, C/V–106, and C/V–108 are energized directly. The filaments of tubes C/V–101 through C/V–105, C/V–107, and C/V–7 through C/V–11 are energized through normally closed contacts 2 and 1 of transmit-control relay C/O–101.

b. Dial LAMP C/E–201 (J–03) parallels the filament circuits when the ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch, C/S–202, is in any position except OFF. Dummy load resistor C/R–137 can be inserted in place of the dial lamp with switch C/S–202 in the OFF position by placing the FIELD–VEH–TANK switch C/S–101 in the VEH or TANK position. However, the resistor is not completed to ground for field operation since the dry batteries used in Case CY–590/GRC provide sufficient regulation. To avoid unnecessary drain on the batteries, the FIELD-VEH-TANK switch should be kept in the FIELD position at all times (par. 15).

38. Receiver Plate and Screen Supply

(fig. 36)

a. Terminals H (B,01) and J (B,02) of C/J–203 supply the 90-volt potential for the plate and screen requirements of tubes C/V–3 through C/V–5, C/V–8 through C/V–11, and C/V–101 through C/V–105, and C/V–108; also the plate requirements of tubes C/V–1, C/V–2, C/V–6, and C/V–107; and the screen requirements of C/V–106. The application of screen voltage for tubes C/V–1 and C/V–6 is a function of the transmit control relay C/O–101. Screen voltage for the squelch-oscillator tube, C/V–107, is under control of the SQUELCH switch C/S–201. The tube is supplied through potentiometer C/R–202 in series with resistor C/R–201. The potentiometer and resistor place a constant small drain on the power supply when the battery ground circuit is complete.

b. The plate and screen of the calibrate-oscillator C/V–7 and the screen of the beat-oscillator C/V–106 are supplied through section 1B rear of ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch, C/S–202. In the ANT ADJ position tube C/V–7 is supplied. In the CAL position both tube C/V–7 and tube C/V–106 are supplied.

Caution: If the FIELD-VEH-TANK switch is placed in either the VEH or TANK position, resistor C/R–136 will be placed across the 90-volt supply through normally closed contacts 5 and 4 (C,06) of relay C/O–101, greatly reducing the battery life.

39. Monitoring

(fig. 36)

When the filament and plate and screen circuit voltages have been supplied as described above (pars. 37 and 38), the receiver is ready for monitoring. The output of the receiver is supplied to the handset earpiece through the connection at the AUDIO receptacle C/J–202A (I,10). (Figure 36 shows the handset in the inset at location B,15, and shows the Control Group AN/GRA–6 connected to the AUDIO receptacle C/J–202 (F,07; F,09; and I,10). This is done for convenience and should not be considered the standard connection.) Monitoring theory with Control Group AN/GRA–6 connected to the AUDIO receptacle C/J–202 is discussed in paragraphs 58*d* and 58*e*.

40. Transmit Controls

(fig. 36)

With the set in a monitoring condition (par. 39), pressing the push-to-talk button on the handset completes the ground circuit for the microphone and transmit control lines (shown in inset at location B,14 on figure 36).

41. Relay Operation

(fig. 36)

Relay potential for transmit-control relay C/O–101 (F,09) is supplied from terminal B of POWER receptacle C/J–203. When the ground line is completed through the push-to-talk contacts, the relay functions to perform the following operations:

a. Contacts 1 and 2 open and contacts 2 and 3 close to switch filament voltage from the receiver to transmitter tubes (F,06).

b. Contacts 8 and 9 close to supply screen voltage to microphone amplifier C/V–1 and power amplifier C/V–6 (C, 06).

c. Contacts 7 and 6 close to complete a sidetone circuit from the microphone transformer to the grid of the audio amplifier C/V–106. A bleeder resistor, C/R–138, across the sidetone circuit lowers the sidetone level for the FIELD position of the FIELD-VEH-TANK switch C/S–101.

d. Contacts 4 and 5 open, but their operation has no effect on set functioning since the FIELD-VEH-TANK switch is always kept in the FIELD position.

42. Transmitter Signal Path

(fig. 36)

When the switching actions described above have taken place, the transmitter will be operative and talking into the mouthpiece will cause modulation of the transmitter carrier frequency. The voice signal from the handset mouthpiece is coupled to microphone-amplifier stage C/V–1 by transformer C/T–1 (F, 08). The microphone energizing voltage is supplied from the transmitter filament source through dropping resistor C/R–1 and winding 7–6 of transformer C/T–1. To trace the signal path through the transmitter, refer to the block diagram (fig. 13) and to the schematic diagram (fig. 35).

Section III. UNIT THEORY

43. Scope

The discussion of unit theory is limited to a block diagram analysis of the Receiver-Transmitter RT–70/GRC and a discussion of the circuits in Case CY–590/GRC. Although the maintenance information included in this manual is at an organizational level only, familiarity with the block diagram of the receiver-transmitter should be helpful in trouble shooting. A knowledge of which tubes are receiving tubes and which tubes are transmitting tubes, for example, will aid in the replacement of parts for which the operator has running spares. The block diagram is shown in figure 13. Complete schematic diagrams for Case CY–590/GRC and Receiver-Transmitter RT–70/GRC are included (figs. 15 and 35, respectively) as additional information for maintenance personnel. Figure 14 shows the interconnection of the battery box, the power cable assembly, and the receiver-transmitter.

44. Case CY–590/GRC

Figure 15 is a schematic diagram of Case CY–590/GRC, the power supply for Radio Set AN/PRC–16. The diagram shows the l-v and B+ battery and the associated circuit components.

a. General. Case CY–590/GRC is a battery box containing a 90-volt and a 7.5-volt source. The 90-volt source, consisting of one Battery BA–419/U, supplies the plate and screen circuits. The 7.5-volt source consisting of five 1.5-volt Batteries BA–403/U connected in series, supplies the filaments, relay C/O–101, and the handset microphone. A switch on the case panel is used to make or break the battery circuit to the receiver transmitter for local or remote operation. Two receptacles, J–1 and J–2, on the front panel of the case provide for interconnection to other units with which Case CY–590/GRC is used. In Radio Set AN/PRC–16, receptacle J–1 is connected to the receiver-transmitter by means of Power Cable Assembly CX–1209/U. Receptacle J–2 is not used with the set. A common ground is established through terminals K and D of the power cable assembly and C/J–203D.

b. L-V Supply. Three branch supply circuits are brought to receptacle J–1 from the 7.5 volt supply.

(1) The circuit connected to terminal H of J–1 through dropping resistor R–1 supplies the receiver-transmitter filaments and dial light.

(2) The circuit connected to terminal J of J–1 through dropping resistor R–3 supplies the energizing potential for relay C/O–101. The relay circuit is completed when the relay ground line is connected by operation of the handset push-to-talk switch.

(3) The circuit connected to terminal L of J–1 through dropping resistor R–2 is not used in Radio Set AN/PRC–16.

c. H-V Supply. The 90-volt supply of Battery BA–419/U is applied to terminal B of J–1 for use in the plate and screen circuits of the receiver-transmitter.

45. Receiver-Transmitter RT–70/GRC

(fig. 35)

a. General. The signal path of the receiver-transmitter is shown in the functional block diagram (fig. 13). A complete schematic diagram of the equipment is shown in figure 35. The block diagram shows that the equipment consists of a separate transmitter circuit and a separate receiver circuit. The two circuits are associated with each other through a common antenna circuit, a common 32- to 42.3-mc oscillator, and a common tuning control. Normally, the receiver is operative, while the transmitter is in a stand-by, or inoperative condition. When the microphone button

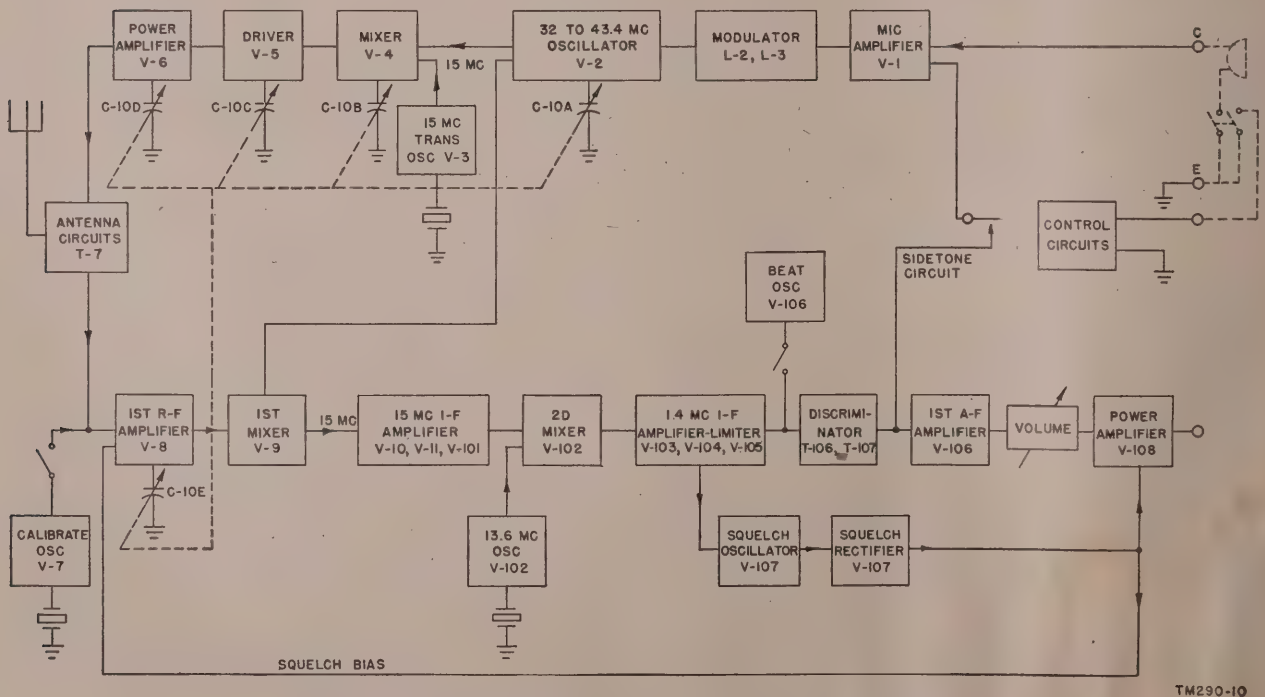


Figure 13. Receiver-Transmitter RT–70/GRC, block diagram.

is closed, that is, when the operator desires to talk, the receiver is effectively turned off and the transmitter is turned on. This function is accomplished by a relay control circuit, also indicated on the block diagram. The frequency range of the transmitter and of the receiver is from 47 to 58.4 mc.

b. Transmitter Signal Path. The function of the transmitter is to convert speech signals from the external or audio source into f-m or r-f signals. Voice signals from the audio source are amplified by microphone-amplifier stage V–1 to the proper value for modulation. Audio voltages are applied to modulator coils L–2 and L–3 to vary the frequency generated by the variable oscillator, V–2, in accordance with the amplitude and frequency of the audio signal. The output of the oscillator and the second harmonic of the frequency generated by a fixed crystal oscillator, V–3, are combined in mixer stage V–4. The desired sum frequency at the output of the transmitter mixer is selected by a tuned circuit and is applied to the transmitter-driver stage V–5. The signal is again amplified and applied to the transmitter power-amplifier stage, V–6. The amplified output is then routed through a tuned antenna circuit to the antenna. No antenna switching is provided, since the transmitter power output is low, the receiver is inoperative when the transmitter is energized, and an isolation network is used between the transmitter output and the receiver input.

c. Receiver Circuits.

(1) The function of the receiver is to accept f-m carrier signals and to convert them, by a double conversion process and by means of an f-m discriminator, into the originally transmitted audio signals. The audio signals are then applied to an external audio receiving device.

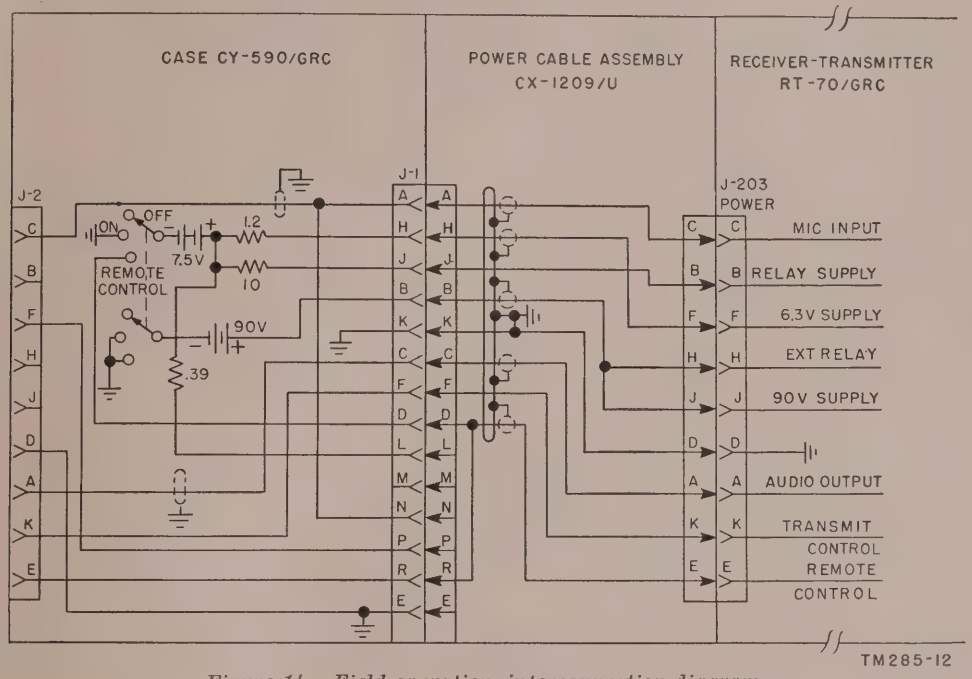


Figure 14. Field operation, interconnection diagram.

(2) Carrier signals from the antenna are applied through the common antenna circuit to the first r-f amplifier stage, V–8, the output of which is tuned by a section of the variable gang capacitor. The amplified output of this stage and the output of the common variable oscillator, V–2, is applied to mixer stage V–9, which produces sum and difference frequencies. The difference frequency is selected by the tuning circuit of the mixer and is routed as a band of frequencies centered about 15 mc to a three-stage i-f amplifier (V–10, V–11, and V–101).

(3) The 15-mc output of V–101, in conjunction with the 13.6-mc output of a second

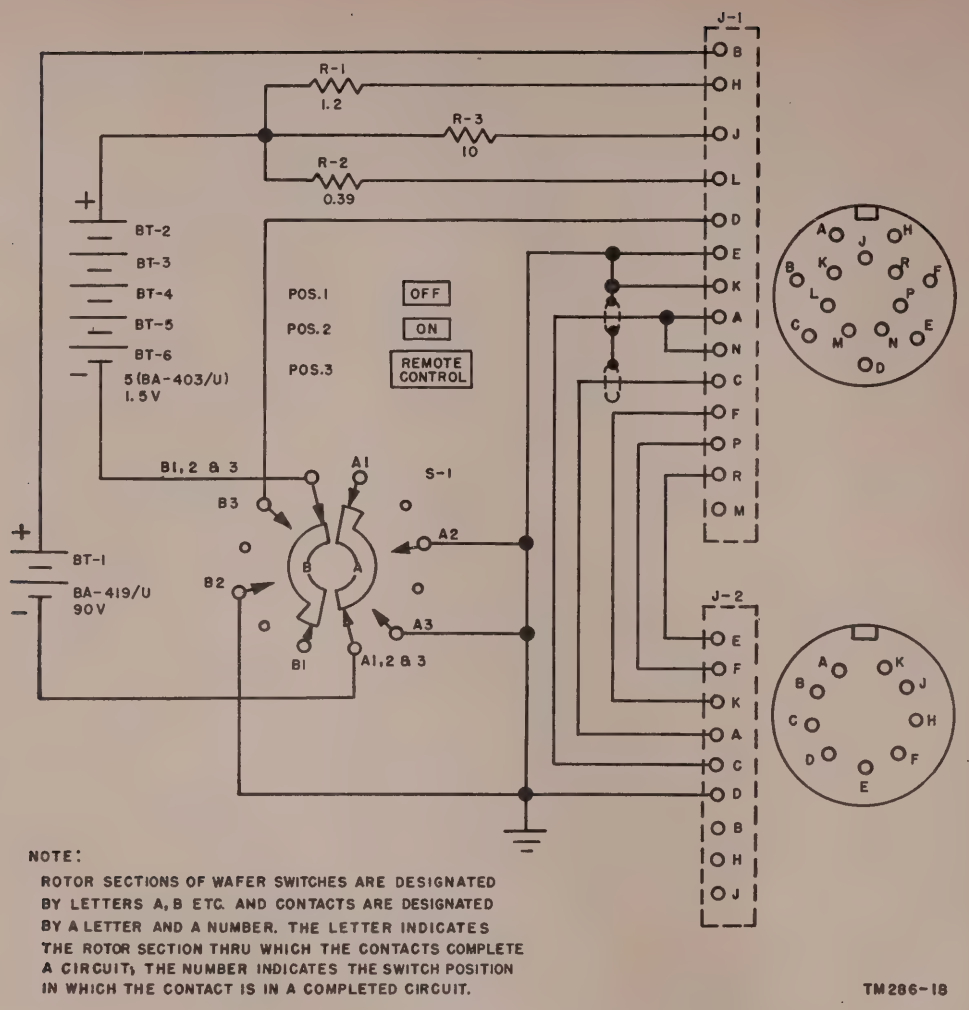


Figure 15. Case CY–590/GRC, schematic diagram.

crystal-controlled oscillator circuit (part of V–102), is combined in the receiver second mixer portion of V–102 to produce a second i. f. centered about 1.4 mc. This signal is again amplified in a three-stage amplifier (V–103, V–104, and V–105). The first stage, V–103, is a conventional 1.4-mc i-f amplifier. The second and third stages, V–104 and V–105, have the additional function of limiting (or eliminating) any amplitude variations of the signal. Such amplitude variations represent noise and are undesirable. In addition, the proper functioning of discriminator T–107, which follows the second limiter, V–105, requires that the level of the applied signal be fairly uniform for variations in the level of the incoming signal.

(4) The output of the second limiter stage is applied to the discriminator circuit, T–106 and T–107, which functions to extract the intelligence or audio modulation from the incoming signal. The discriminator converts variations from the center frequency of the incoming signal into audio signals. These audio signals appearing at the output of the discriminator, are amplified in the two-stage audio amplifier, V–106 and V–108, and are applied to the receiver output terminals of the panel-mounted POWER and AUDIO receptacles. The VOLUME control is located between the output of the first a-f amplifier and the input of the second a-f amplifier.

d. Sidetone. A portion of the audio signal applied to the transmitter is routed over a special

path called a sidetone path, which includes a pair of normally open contacts of the transmit-control relay, to the receiver audio circuits. There it is amplified and becomes audible in the earpiece of the handset or in the headset of the operator. The signal is useful for two reasons: it permits monitoring the transmission and it imparts a natural effect in the earpiece of the handset. Without sidetone, the circuit would seem dead. When the receiver-transmitter is in stand-by or receiving condition, the relay contacts are open and the sidetone circuit is broken. When the microphone push-to-talk switch is pressed and relay C/O–101 is energized, its contacts close and complete the sidetone path. With the FIELD-VEH-TANK switch C/S–101 in the VEH position a voltage divider circuit (C/R–140, C/R–138, and the contacts of C/S–101) is established. The function of this is to reduce the sidetone level sufficiently to prevent an acoustic feedback path through the handset from being established.

e. Squelch Circuit. It is characteristic of very sensitive receivers that in the absence of a received signal a rushing noise is heard in the receiver phones or loudspeaker. The noise is the result of thermal agitation in the vacuum tubes and receiver components and of external electrical disturbances. A squelch circuit, therefore, is used to suppress this annoying noise during no-signal intervals. In Receiver-Transmitter RT–70/GRC, the squelch circuit consists of a carrier switched 30-kc (approximately) oscillator followed electrically by a diode rectifier. Actually, the oscillator and diode rectifier are in the same envelope of multipurpose tube V–107. When the receiver is in a squelched condition and no signal is being received, the squelch circuit is operative and biases the audio amplifier and the first r-f amplier to cut off. When a signal is received which has the proper signal strength, the squelch is disabled and the r-f and audio amplifiers are restored to normal operation. Squelch action is adjustable by means of the panel-mounted SQUELCH control, R–202. The OFF position of this control operates switch S–201 and disables the squelch for test purposes or for reception of weak or fading signals.

f. Calibrating and Test Circuit. A calibrating circuit associated with the receiver includes a 1-mc crystal-controlled calibrate oscillator V–7, the output of which is very rich in harmonics, and a 1.4-mc beat oscillator derived from a portion of the first audio amplifier tube V–106 and the ANT ADJ-DIAL LIGHT (ON-OFF)-CAL test switch S–202.

(1) *Calibrate oscillator.* A signal for use in calibrating the receiver at frequency settings of the dial which are multiples of 1 mc is generated by crystal oscillator V–7. This oscillator is permanently associated with the input of the first r-f amplifier tube V–8 of the receiver. When the test switch is in either the ANT ADJ or in the CAL position, the oscillator is turned on and generates a frequency of 1 mc. The harmonics of this signal are selected by the tuned circuits of the receiver, the particular harmonic selected depending on the frequency to which the receiver is tuned.

(2) *Beat oscillator.* When the test switch is in the CAL position, the first audio amplifier stage, V–106, functions as a combined 1.4-mc crystal oscillator and an audio amplifier. The output of this oscillator is connected at a point ahead of the discriminator rectifiers. Since the frequency generated by this oscillator is the same as that to which the 1.4-mc i-f amplifier is tuned, a zero beat is obtained at the output of the discriminator when a 1.4-mc signal enters the discriminator. An audio beat note is obtained when the i-f signal at the discriminator input is different from 1.4 mc. This a-f beat enables precise frequency adjustments to be made.

(3) *Use.* If either the 13.6-mc oscillator or the 32- to 43.4-mc oscillator is off frequency, the signal entering the discriminator circuit will not be 1.4 mc, and, therefore, an audible beat note will be heard. However, as long as the oscillators are all on frequency, a zero-beat note will be obtained. The calibrate oscillator alone can be used to check the tuning of the antenna circuit, since proper alinement will cause quieting of the noise in the receiver. The combination of the beat oscillator and the calibrate oscillator may be used to check the calibrate oscillator (V–7), the receiver 13.6-mc oscillator (part of V–102), the tuning of the common 32- to 43.4-mc oscillator (V–2), and the tuning of the over-all receiver.

CHAPTER 5

ORGANIZATIONAL MAINTENANCE

Section I. TROUBLE SHOOTING

46. Scope

Trouble shooting at an organizational level is limited to the sectionalizing of troubles to defective units which must be replaced as a unit, or to the localizing of defective parts, such as tubes and the dial light. An equipment performance checklist (par. 47) is included as a sectionalization and localization aid.

47. Equipment Performance Checklist

a. Purpose. The equipment performance checklist (table III) provides a detailed logical procedure for checking the operation of the radio set. It should be used after the initial installation of the equipment before the equipment is placed in service, and periodically thereafter, and as an aid in trouble shooting.

b. Use of the Checklist for Trouble Shooting.

(1) The checklist is arranged in the same sequence as that followed by the operator when initially applying power to the equipment. The simplest procedure when using the checklist is to perform the various steps on the list in sequence until an abnormal indication is observed.

(2) The first five columns of the checklist show the items to be checked, the units which are involved, the action to be taken, and the normal indication to be expected. When an abnormal indication is observed, the operator should refer to the sixth column which outlines the localizing procedures for the specific units.

Section II. REPLACEMENT OF PARTS

48. General

The following paragraphs list procedures for the replacement of parts for which running spares are provided. Running spares for each unit are listed in paragraph 12. The procedures described will be necessary as a result of sectionalizing trouble to a particular unit and as an aid to localizing trouble to a particular component part.

Note. No lubrication is required for Radio Set AN/PRC–16.

49. Removing Immersionproof Cases

Replacement of pluck-out parts necessitates the removal of the immersionproof cases which house the panel-chassis assemblies of the two units. To remove the case of the receiver-transmitter or the battery box, perform the following steps:

a. Remove all the external connections from the unit involved.

b. Remove the unit from the mounting.

c. Loosen the Dzus fasteners located at the edges of the unit.

d. Slide the panel-chassis assembly out of the case. Take care not to damage any wiring or components while removing and handling the panel-chassis assembly.

50. Receiver-Transmitter RT–70/GRC

The dial lamp and the tubes are the only replaceable parts in the receiver-transmitter. The tubes are located on the vertical r-f and i-f chassis (fig. 17). The schematic diagram of the filament circuit (fig. 16) is helpful in locating tube filament trouble.

a. To gain access to the tubes, remove the panel-chassis assembly from the case (par. 49). To remove any tube, first remove the tube shield and then use a tube puller. Do not rock or jiggle the

Table III. Equipment performance checklist

Item No.	Unit	Item	Action or condition	Normal indications	Possible troubles or defective units
1	Battery box	OFF-ON-REMOTE CONTROL switch.	Set at OFF		
2		Cabling	All connections properly made, including connection of handset (fig. 1).		
3	Receiver-transmitter	VOLUME control	Turn to maximum clockwise position.		
4	Receiver-transmitter	SQUELCH control	Turn completely clockwise for maximum squelch action.		
5	Receiver-transmitter	ANT ADJ-DIAL LIGHT (ON-OFF) -CAL switch.	Set at DIAL LIGHT-ON		
6	Receiver-transmitter	FIELD-VEH-TANK switch (internal).	Set at FIELD		
7	Battery box	OFF-ON-REMOTE CONTROL switch.	Set at ON position	LAMP on receiver-transmitter panel glows. When normal indication is obtained turn ANT ADJ-DIAL LIGHT (ON-OFF)-CAL switch to OFF position.	If dial LAMP does not light, or is unsually dim, check batteries, lamp, battery box wiring (fig. 15).
8	Receiver-transmitter	SQUELCH and VOLUME controls.	Turn SQUELCH control to OFF. Turn VOLUME control to obtain a comfortable noise level at the handset. (If signal is received, tune to an open channel.)	Rushing noise or signal heard in handset.	If no noise is heard in the handset (and the lamp is lit) the trouble is probably in the receiver section or in the battery box. Check the tubes in the receiver-transmitter (figs. 17, 18, and 19).
8	Receiver-transmitter	ANT ADJ-DIAL* LIGHT (ON-OFF)-CAL switch.	Set switch at CAL and tune dial over entire range. Tune for noise output when check is completed.	Zero-beat indications at each mc. Calibration should remain accurate, within 25 kc (¼ space either side of mark) throughout range. Noise should come back when switch is reset to DIAL LIGHT OFF (or ON) position.	If no indication is heard check tubes V–7 and V–106 in the receiver-transmitter (figs. 18 and 19).
10	Receiver-transmitter	SQUELCH control	Turn clockwise until receiver just squelches.	No output at handset	Squelch circuit.
11	Receiver-transmitter	Tuning knob	Tune in signal (par. 28)	Signal heard in handset	Defective receiver circuit, check V–8, V–2, and V–102.

*Unless there is an indication that the calibration is off omit step 9, as this step will cause an unnecessary drain on the batteries.

Table III. Equipment performance checklist—Continued

Item No.	Unit	Item	Action or condition	Normal indications	Possible troubles or defective units
12	Receiver-transmitter	Handset	Press the push-to-talk switch on the handset and talk into mouthpiece. If possible, arrange for a monitor to check transmission. If no monitor is available hold a #331 lamp near the antenna.	Sidetone is heard in handset earpiece. Transmitter power output indication obtained with lamp or monitor.	If the lamp does not light or the radio monitor does not respond, check the transmitter tubes (fig. 18). If sidetone is not heard relay circuit is defective.
13	Battery box	OFF-ON-REMOTE CONTROL switch.	Turn to OFF.		

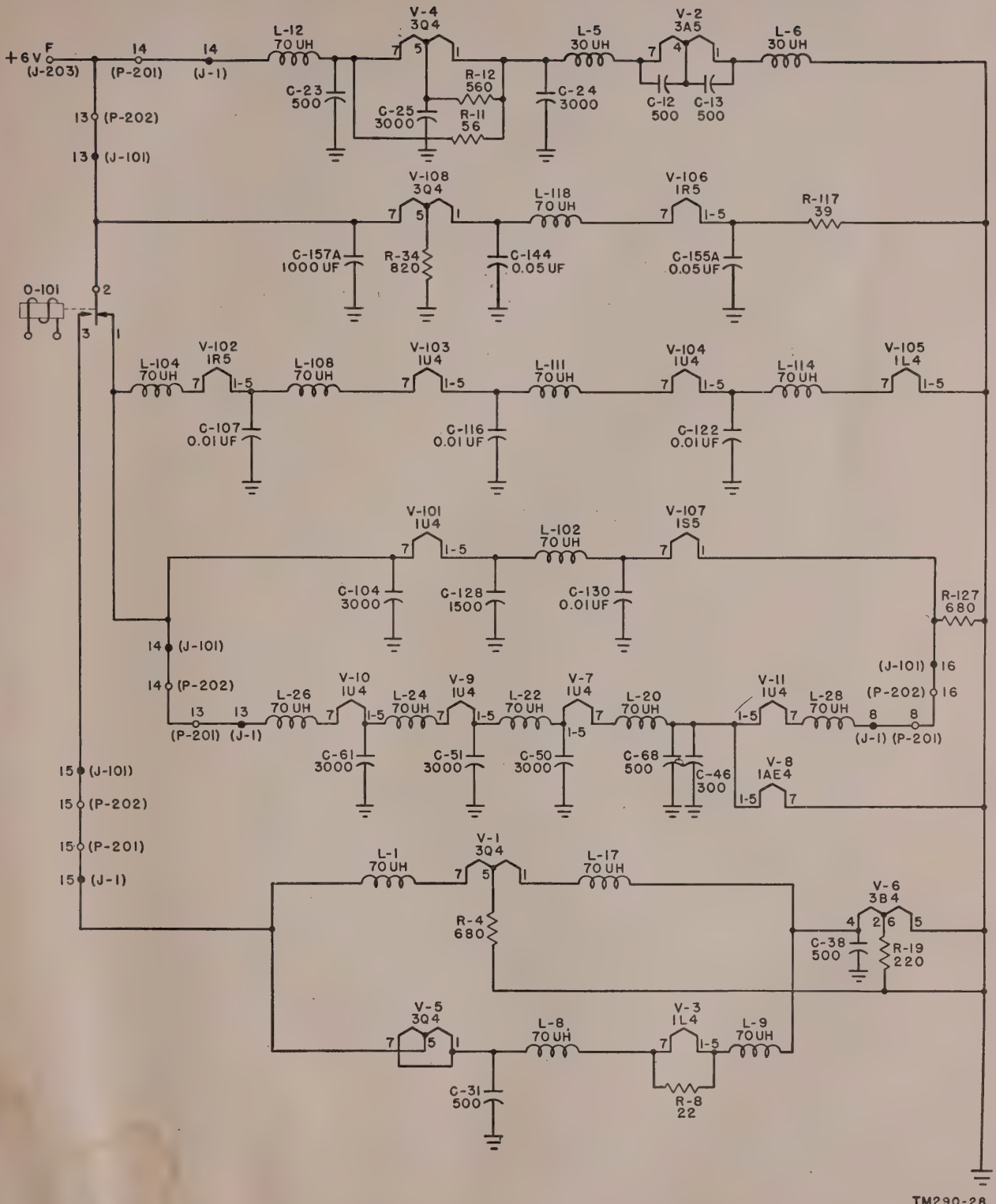


Figure 16. Receiver-Transmitter RT-70/GRC, filament circuit schematic diagram.

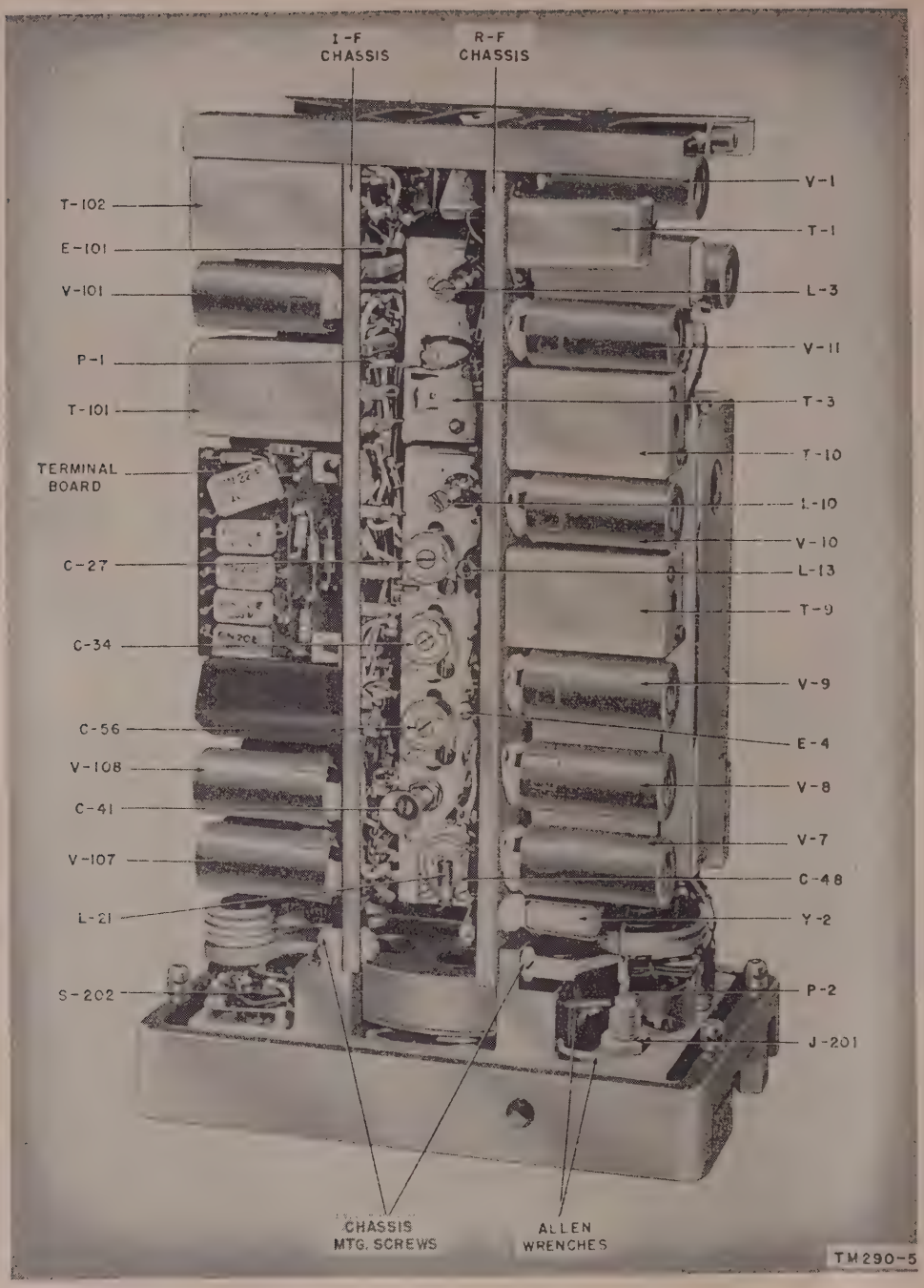


Figure 17. Receiver-Transmitter RT-70/GRC, top view of panel-chassis assembly.

tube; a tube may be damaged by careless handling. Tube locations are shown on figures 18 and 19.

b. The lamp is accessible from the front panel. Remove the screw, located just below the tuning dial window, which holds the lamp in its socket against a spring tension. When replacing the lamp, insert the bulb forward in the socket so that the retaining screw supplies a contact at the base of the bulb.

51. Case CY-590/GRC

The five 1.5-volt Batteries BA-403/U and the one 90-volt Battery BA-419/U are the only re-

placeable parts in the battery box. After removing the immersionproof case (par. 49), perform the following steps to gain access to the batteries (figs. 8 and 9).

a. Raise the back plate fastener which will partially disengage the back plate from the battery tray chassis. The back plate should then be tilted back on its hinged base.

b. Remove the battery plugs from the tops of the individual batteries.

c. Remove the batteries. Test and replace them if necessary.

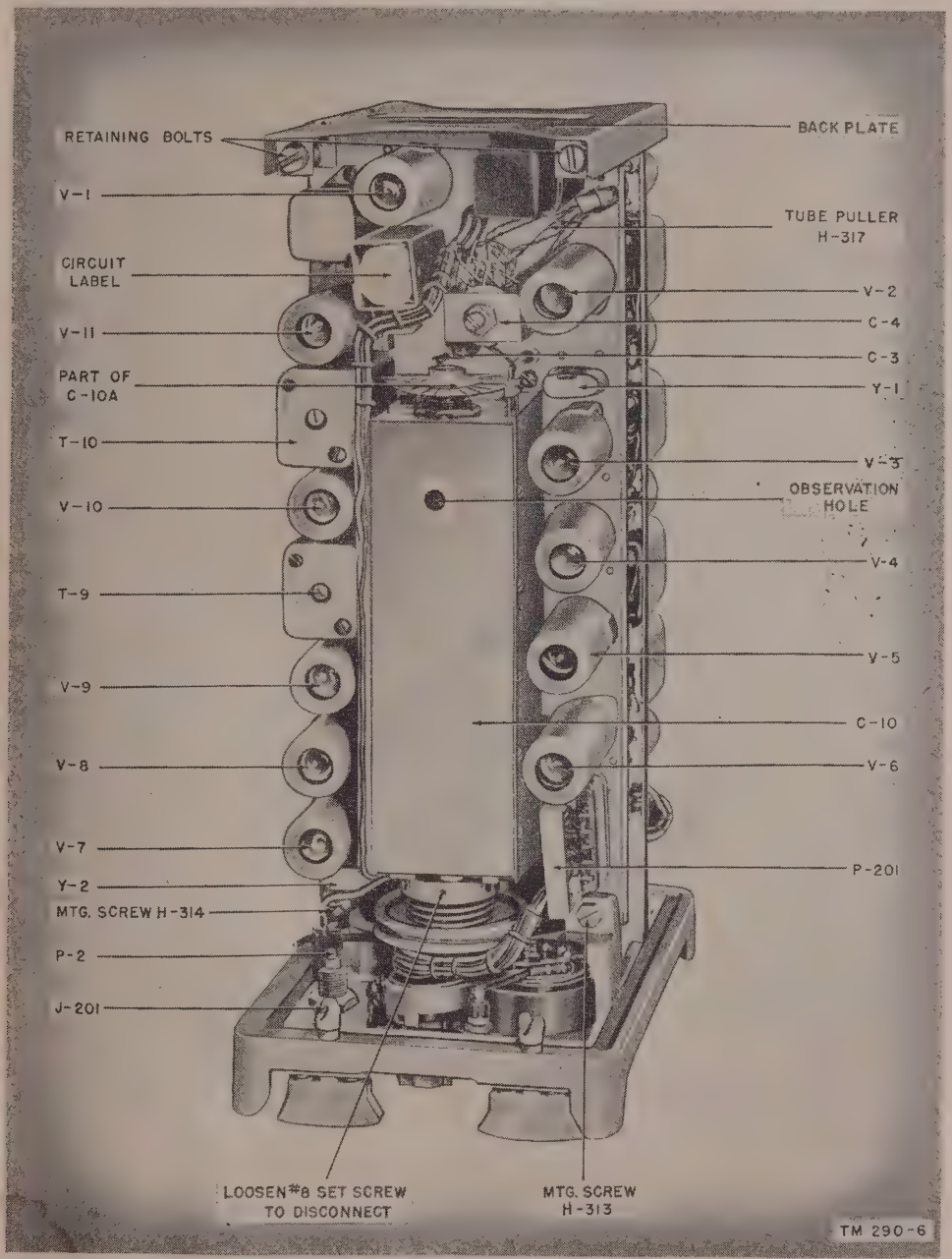


Figure 18. Receiver-Transmitter RT-70/GRC, view of r-f chassis.

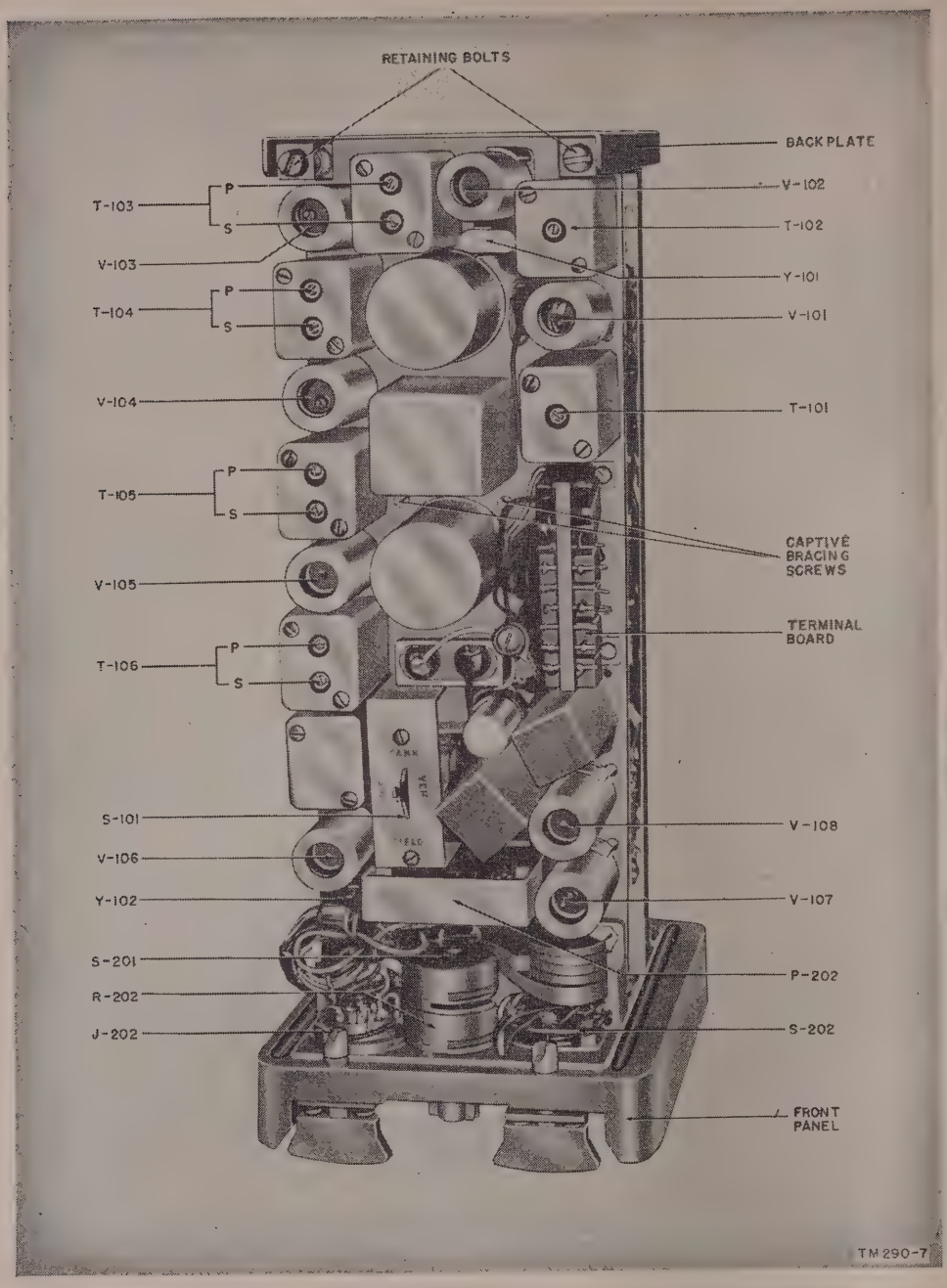


Figure 19. Receiver-Transmitter RT-70/GRC, view of i-f chassis.

CHAPTER 6

AUXILIARY EQUIPMENT

Note. Auxiliary equipment is equipment which is not supplied as part of the radio set (par. 6) but which extends the application of the set in some manner. The auxiliary units described in this chapter are Control Group AN/GRA–6 (sec. I) and Chest Set Group AN/GSA–6 with Headset-Microphone H–63/U (sec. II). For procurement information refer to applicable Army Supply Catalog. The three items described in this chapter may be used in conjunction with each other but are also procurable as separate items. However, when Chest Set Group AN/GSA–6 is used, the headset-microphone also must be used.

Section I. CONTROL GROUP AN/GRA–6

52. Purpose and Use

a. Control Group AN/GRA–6 provides the means for controlling and operating Radio Set AN/PRC–16 from a position approximately 2 miles away from the location of the set. In addition, the control group makes provision for local control of the radio set through a continuous d-c circuit, and for two-way telephone communication and ringing between the remote and local control operators. The local control position consists of Local Control C–434/GRC, while the remote control position consists of Remote Control C–433/GRC. In addition to these basic components, Control Group AN/GRA–6 includes Handset H–33/PT with cable, connector-plug, push-to-talk switch, and a carrying or storing container, Bag CW–189/GR. Connection between the local and remote control positions is provided by a pair of telephone wires, not supplied as part of this equipment.

b. The range of communication between the remote and local control units and the range of remote control of the radio set is at least 2 miles. Under favorable conditions the range may be extended, depending on the type of connecting telephone line, the weather, and local noise interference conditions.

c. In a typical application, the remote control unit is carried by the remote operator by means of the shoulder strap provided for this purpose, while the local control unit is cable-connected directly to the radio set panel. When the two control units are equipped with plug-in dry batteries, for which compartments are provided in each unit, and with suitable handsets, the control group may be used as either a field telephone set or as remote and local control positions for push-to-talk operation through the radio set.

d. A table of components of Control Group AN/GRA–6 is provided below. All dimensions and weights are approximate. The table includes basic components only. For placing the equipment in operation, the additional equipment listed in subparagraph e also is required.

Component	Required No.	Height (in.)	Depth (in.)	Length (in.)	Volume (cu. ft.)	Unit weight (lb.)
Local Control C–434/GRC	1	3½	10⅛	8⁹⁄₁₆	0. 17	10½
Remote Control C–433/GRC	1	3½	7³⁄₃₂	8¼	. 12	7
Handset H–33/PT	1	2³⁄₆₄	3	7⅞	. 03	1⅛
Bag CW–189/GR	1	11	7¾	10⅝	. 52	2⅛
Running spares	(set) 1				. 1	. 1
Total					. 94	20. 85

Note. This list is for general information only. See the appropriate supply publications for information pertaining to the requisitioning of spare parts.

e. To install and operate Control Group AN/GRA–6, the following parts and materials are required in addition to the basic components listed in *d* above.

(1) Four 1½-volt dry cells, Battery BA–30 (2 each for the local and remote control units).

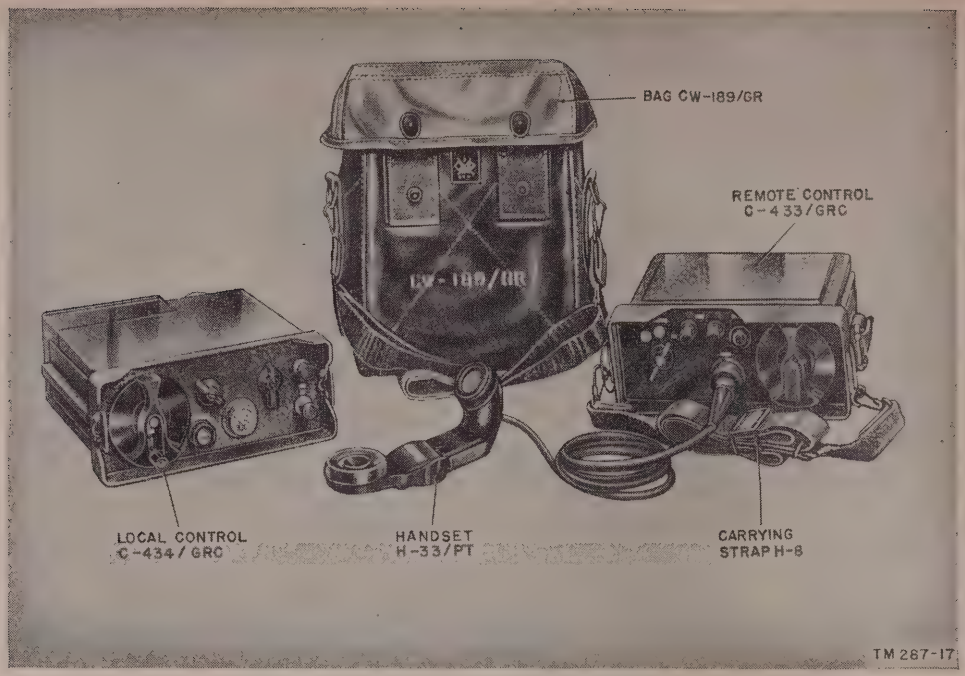


Figure 20. Control Group AN/GRA–6.

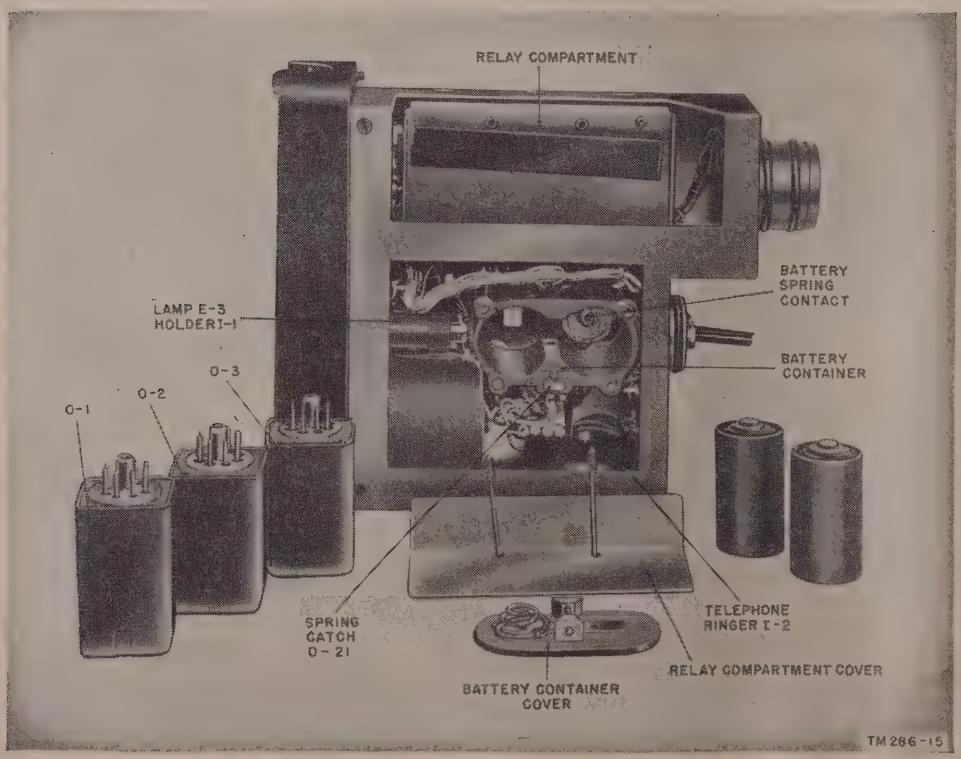


Figure 21. Local Control C–434/GRC, top view of chassis.

(2) One 45-volt dry battery, Battery BA–414/U (remote unit only).
(3) Telephone line.
(4) An additional Handset H–33/PT may be required for field service use.

Note. If Chest Set Group AN/GSA–6 and Headset-Microphone H–63/U are available, the combination of these two components may be used as the additional audio device.

53. Description of Components

a. General. The components of Control Group AN/GRA–6 are shown in figure 20. The components are compact, lightweight and suitable for portable use. When not in use, the control units and the handset can be stored in the bag which is equipped with a carrying strap. An additional carrying strap is provided for attachment to the remote control unit. The audio device normally supplied with the radio set may be used in conjunction with the local control unit. Handset H–33/PT normally will be used with the remote control unit.

b. Local Control C–434/GRC (figs. 24, 21, and 23). The local control unit is a compact, lightweight panel-chassis assembly with an immersion-proof outer case. The outer case is held to the panel by means of two wing-type thumbscrews. Channel rails on the sides of the unit and a large connector at the rear of the control unit have no function in this application; they are for use in radio sets which provide mountings suitable for accommodating the unit within the mounting frame. One of the two cables stored in a com-

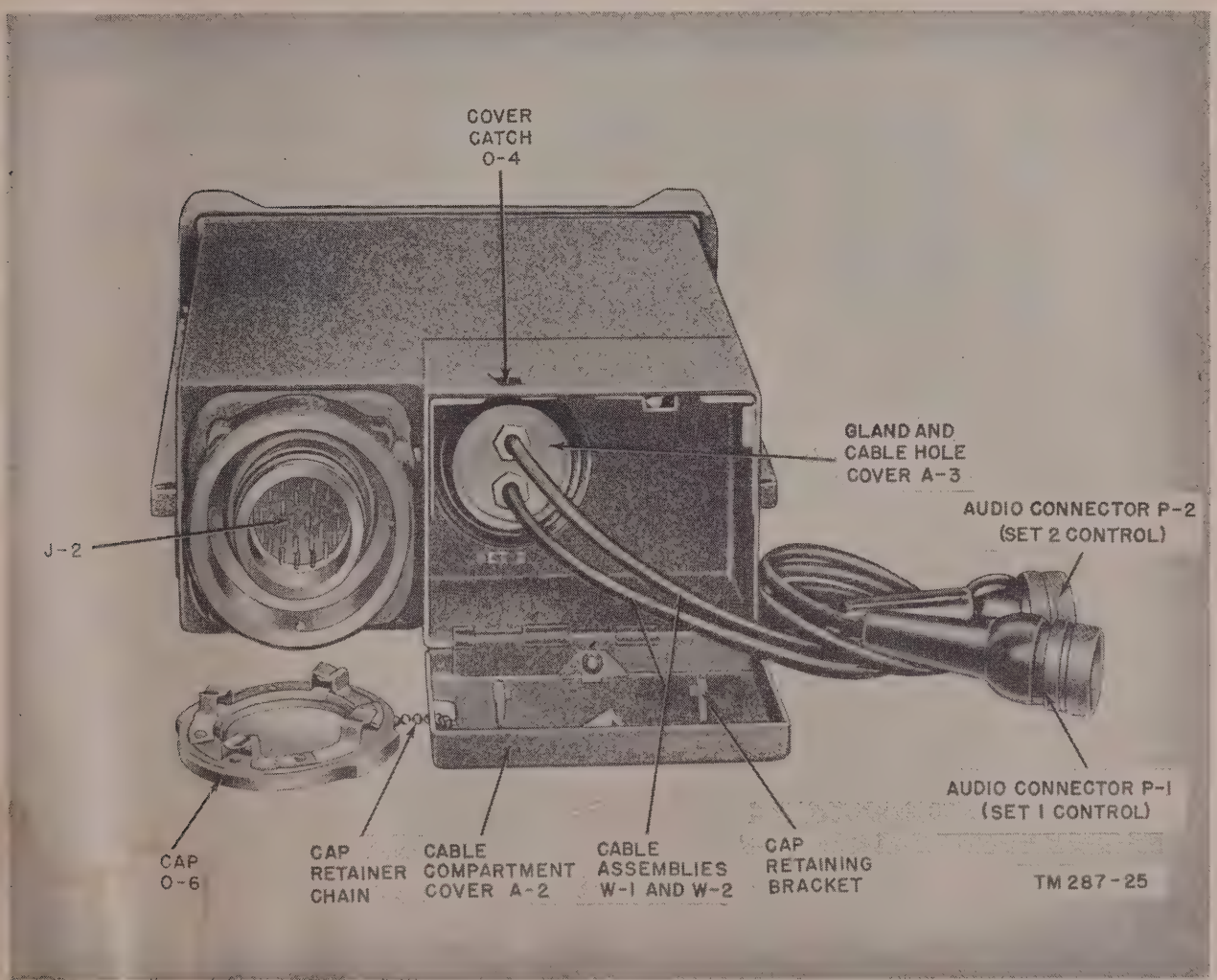


Figure 22. Local Control C–434/GRC, rear view.

partment at the rear of the control unit is used to make connection between the control unit and the radio set. The other cable in the compartment is not used with Radio Set AN/PRC–16. All operating controls are panel-mounted. These include the crank handle of the generator, the neon CALL light with a dimmer, and the REMOTE and LOCAL control switches. The panel is recessed to prevent damage to the controls. Waterproofing is provided by seals and rubber gaskets around bushings and between the outer case and the panel. The panel layout of the unit is shown in figure 24; internal views of the unit are shown in figures 21 and 22. The lamp or bell selecting switch, S–1, is mounted on a bracket on top of the chassis within the unit.

c. Remote Control C–433/GRC. The remote control unit is a compact, lightweight panel-and-chassis assembly with an immersionproof outer cover. The case is held to the panel by means of two snap catches. The unit may be carried by a strap provided for this purpose. "D" rings on the sides of the panel are provided for the strap. When the unit is suspended from the strap in its normal carrying position, the panel-mounted operating controls face upward. Panel-mounted components include the crank handle of the ringing generator and a neon glow CALL LIGHT, two line binding posts, L1 and L2, the AUDIO connector for the handset, and the SELECTOR switch. The panel is recessed to prevent damage to the controls due to impact. A cut-out in the flange around the panel is provided to accommodate the line wires. The two white disks associated with the SELECTOR switch are write-in positions permitting the operator to record the function of the switch position. An internal view of the unit is shown in figure 23. The panel layout of the unit is shown in figure 25. The bell or ringer is mounted in a compartment on the side of the frame. Switch S–1, which selects either the lamp or the bell to provide visual or audible indication of an incoming ringing signal, is mounted within the control unit.

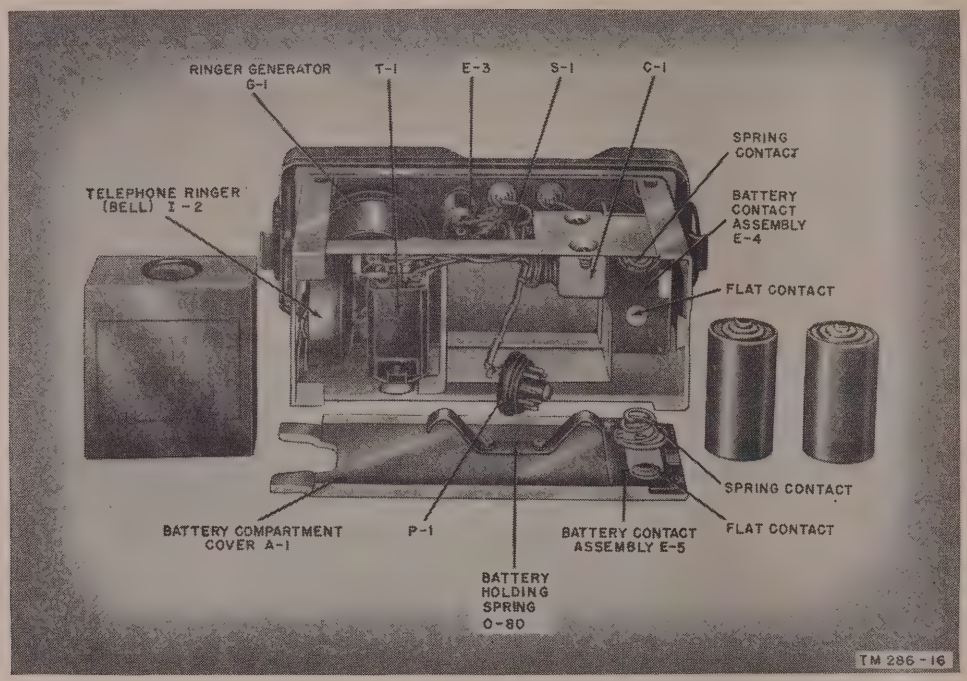


Figure 23. Remote Control C–433/GRC, top view.

d. Handset H–33/PT. The handset includes a 40-ohm carbon type microphone, a 300-ohm earpiece, a nonlocking push-to-talk switch, and a 5-foot cord terminated in a 10-pin connector which mates with the AUDIO connectors on the control unit and the receiver-transmitter panels. The push-to-talk switch receptacle incorporates a DPST (double-pole single-throw) switch which closes when the bar on the side of the handset grip is depressed.

e. Bag CW–189/GR. This dust and waterproof canvas carrying bag is large enough to accommodate the two control units and the handset when not in use. It is equipped with a carrying strap.

f. Running Spares. The running spare parts supplied with each Control Group AN/GRA–6 are four lamps, glow, 125-volt, 1/25-watt G. E. Lamp NE–51.

54. Installation

a. Unpacking Instructions. The components of Control Group AN/GRA–6 are packed individually in cardboard containers, but are shipped collectively in a single wooden box. The following points of procedure should be observed whenever possible.

(1) Pick a location for unpacking that is relatively free from dust, dirt, and moisture.
(2) Remove and save the packing slip.
(3) Use cutters to clip metal bands. If cutters are not available, twist the band with pliers until it breaks.
(4) Use a nail puller to remove the nails and then lift off the sides and/or the top of the box.
(5) As the box is unpacked, check the contents against the master packing slip to make sure that all required materials are there. If any are missing, make out a shortage report as required.
(6) Lift out unit packages.
(7) Slit the waterproof barrier at the seams and remove it from the package.
(8) Slit the seal of the outer carton and remove the package of silica gel.
(9) Slit the seams of the inner carton and open the flaps.
(10) Lift out all corrugated fiberboard cells and pads.
(11) Lift out the contents.

Note. Be careful not to damage packing materials any more than necessary. If possible, store the inside packaging materials in their respective shipping containers and save them for re-use. Desiccants or dehydrating agents (silica gel bags) should be destroyed or set aside for reactivation, depending on the instructions.

b. Installation of Remote Control C–433/GRC. The remote control unit is intended for portable use. To prepare the unit, proceed as follows:

(1) Set the panel-mounted SELECTOR switch to the TEL position.
(2) Release the two snap catches which hold the outer case to the panel-and-chassis assembly, and remove the unit from the case.
(3) Remove the tape which secures the battery compartment cover to the sides of the unit, and remove the cover. To do this, slide the cover back slightly to clear the tab on one side; then lift the cover off.
(4) Install two Batteries BA–30 in the compartment provided for them on the left rear of the chassis frame. Install one battery in the compartment so that the bottom of the battery outer case (negative electrode) rests over the spring contact on the battery compartment floor. Install the second battery so that the center post (positive electrode) of the battery rests on the flat contact on the battery compartment floor.
(5) Insert Battery BA–414/U into the large battery compartment in the chassis frame, so that the octal socket on the battery faces up (toward the rear of the unit).
(6) Insert the octal male plug, P–1, at the end of the battery cable into the battery socket. Do not twist the battery cord excessively to accomplish this.
(7) To restore the battery compartments cover, insert the two projections at one edge of the cover under the bracket angles on the side of the chassis frame. Press the cover down and slide it forward until the lip (or tab) at the other edge of the chassis frame slides over the corresponding notch in the cover. Release the pressure, and check to insure that the tab is locked properly, and that the batteries are positioned properly.
(8) Set the internal BELL-LAMP switch in the BELL position if audible indication of the ringing signal is desired. Set this switch in the LAMP position if a visual indication of the ringing signal is desired.
(9) Check to see that the pilot lamp is installed in its holder. Access to the pilot light is obtained from the rear of the panel by pulling the lamp socket out of

its holder. Pull straight toward the rear of the unit.

(10) Restore the panel-and-chassis assembly in the case and fasten it to the panel by means of the snap catches.

(11) Attach the carrying strap (stored in Bag CW–189/GR) to the D rings on the outer case of the unit.

c. Installation of Local Control C–434/GRC. When used with Radio Set AN/PRC–16 the local control unit is placed in a location near the set and is cabled to the front panel AUDIO connector of the set. To prepare the unit for installation, proceed as follows:

(1) Loosen the thumbscrew fasteners on the panel of Local Control C–434/GRC and remove the panel-and-chassis assembly from the case.

(2) To install the batteries place the panel-and-chassis assembly bottom side up and release the catch holding the battery compartment cover in place. Remove the cover.

(3) Install one battery so that the outer metal base of the battery rests on the spring on the floor of the container.

(4) Install the other battery so that its base faces up, and the center electrode (the positive terminal) rests against the flat battery contact on the floor of the compartment.

(5) Replace the compartment cover, making sure that the batteries make proper connection with the contacts on the cover and within the compartment.

(6) Set the BELL-LAMP switch, mounted on a bracket on the panel-and-chassis assembly, in the BELL position if an audible indication of the ringing signal is desired, or to the LAMP position if a visual ringing signal indication is desired.

(7) Replace the panel-and-chassis assembly in the case, and tighten the screw fasteners.

(8) Press the snap catch (top rear of outer case) to open the hinged door at the right of the plug at the rear of the unit, and extend the two cables with terminating connector plugs stored within the compartment.

(9) Attach the cable with the identification SET 2 to the radio set AUDIO connector. Restore the other cable to the compartment.

(10) Fit the protective cover over the large connector. Lock the cover in place by rotating it. Close the cable compartment door.

d. Installation of Audio Accessories. Handset H–33/PT normally will be used at the remote unit. To install the handset on either unit, attach the connector plug at the end of the handset cord to the AUDIO connector on the control unit. To do this, line up the flats on the cable and panel-mounted connectors, and rotate the cable connector clockwise to lock it in place. When not in use, the handset may be attached to the pocket or belt of the operator, to the rim of the front panel of a control unit, or to the carrying strap of the remote unit by means of a clip. Another Handset H–33/PT (fig. 26) may be used at the other control unit, in which case it is attached to the AUDIO connector of that unit as described above. Chest Set Group AN/GSA–6 with Headset-Microphone H–63/U may be used at the local control unit as an alternate. If the chest set is used, lock the RADIO-INT switch in the RADIO position by means of the internal lock (par. 62). Connect the cable from the chest set to the AUDIO connector on the control unit and the cables from Headset-Microphone H–63/U to the corresponding connectors on the chest set. (Only one audio accessory is provided for each set of the local and remote units.)

e. Installation of Telephone Line. Two line binding posts (LINE L1 and L2) are provided on each of the two control units for connection of the telephone line wires. To make the connection, strip the insulation off the two wires approximately ¾ inch from each end, and, if possible, tin the bared wires before clamping them in the binding posts on each of the two control units. Connect the telephone line so that one wire joins binding posts L1, and the other wire joins the L2 binding posts on the two control units. Check by making continuity measurements.

Note. If the line connections are reversed the functions of the switch positions will be reversed.

55. Methods of Operation

The operational facilities provided by Control Group AN/GRA–6 are summarized below. The operating procedures are described in paragraph 57.

a. Telephone communication with ringing between the two control units.

b. Remote push-to-talk operation of the radio set (Set 2), with control of radio set power at the radio set.

c. Remote push-to-talk operation of the radio set, with remote control of radio set power.

d. Local push-to-talk operation of the radio set, with local control of radio set power.

e. Break-in operation at the local control unit.

Note. On the local control unit there are panel references to SET 1, SET 2, and SET 1 & 2. In this installation, the SET 2 and SET 1 & 2 settings of the switches are effective The SET 1 position is not.

56. Panel Controls and Facilities

a. Local Control C–434/GRC. Figure 24 illustrates the layout of controls and components on Local Control C–434/GRC. The following chart lists the functions of the controls and instruments.

Control or instrument	Function
LOCAL switch (S–3)	Provides for push-to-talk operation of the receiver-transmitter, and for duplex telephone operation with the remote unit. SET 1: Not used. SET 2: Allows push-to-talk operation of the transmitter. TEL: Allows telephone operation with the remote unit, and radio monitoring at the remote unit. (Monitoring circuit is broken if REMOTE switch is at TEL ONLY position.)
REMOTE switch (S–1).	In conjunction with controls at remote unit, the switch provides for remote push-to-talk control of the radio set. Also provides means of limiting operation (at the remote unit) to telephone communication. TEL ONLY: Allows for telephone communication between local and remote control units. SET 1 & 2: Provides for remote push-to-talk operation of the transmitter with power on-off control at the radio set. SET 1: Not used. SET 2: Provides for remote push-to-talk operation of the transmitter with remote control of power.
LINE L1 and L2	Binding posts for telephone line connections.
Ringing generator	Provides means of sending a ringing signal to the remote unit.
CALL LIGHT (E–3).	Indicates (when lit) that a ringing signal is being received from the remote unit. (CALL LIGHT indication can be replaced by a bell by means of an internal switch.) Dimmer control provides for masking glow of the lamp.
AUDIO connector (J–1).	Provides means of connecting a chest set (with head set and microphone) for telephone communication and push-to-talk operation of the radio set.

b. Remote Control C–433/GRC. Figure 25 illustrates the controls and components on the

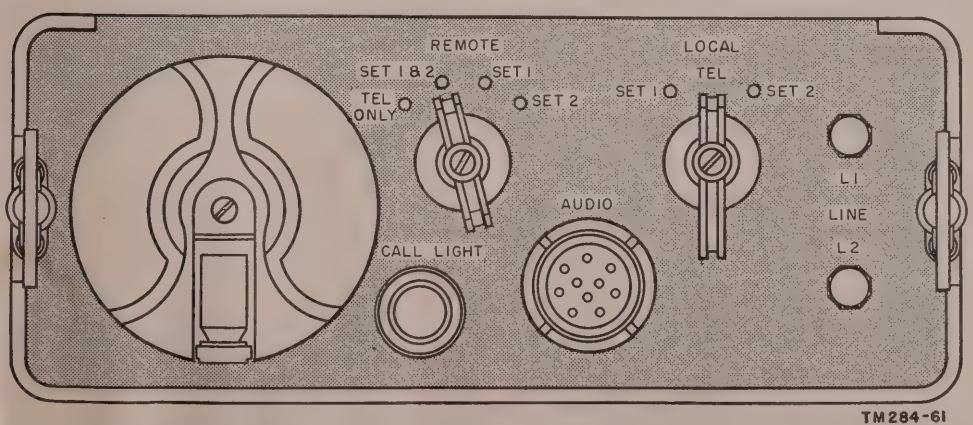


Figure 24. Panel view of local control unit.

front panel of the Remote Control C–433/GRC. The following chart lists the functions of these controls and instruments.

Control or instrument	Function
SELECTOR switch (S–2).	In conjunction with controls at local control unit, the switch provides for remote push-to-talk operation of the receiver-transmitter and telephone communication between local and remote units. Left-hand write-in position:* Provides for remote control of radio set when REMOTE switch on local unit is on SET 2, and for turning on radio set power, when, in addition, the ON-OFF-REMOTE CONTROL switch on Case CY–590/GRC is on REMOTE CONTROL. Right-hand write-in position:* Turns off radio set transmitter and power when REMOTE switch is on SET 2 and ON-OFF-REMOTE CONTROL switch is on REMOTE CONTROL. Turns on transmitter when REMOTE switch is on SET 1 & 2. TEL position: Limits operation (at the remote unit) to monitoring and telephone communication with the local unit.
LINE L1 and L2	Binding posts for connecting the telephone line.
Ringing generator	Provides means of sending a ringing signal to the local control unit.
CALL LIGHT (E–3).	Indicates (when lit) that a ringing signal is being received from the local control unit. (CALL LIGHT indication can be replaced by a bell by means of an internal switch.) Dimmer control provides for masking glow of the lamp.
AUDIO connector (J–1).	Provides means of connecting handset H–33/PT for telephone communication with the local unit and push-to-talk operation of the radio set.

*The functions of the write-in positions will be reversed if the telephone line connections are reversed or if the SET 1 cable of the local unit is connected to the receiver-transmitter.

Caution: The REMOTE switch of Local Control C–434/GRC must be in the TEL ONLY position when the ringing generator is operated. This is necessary to prevent accidental operation of the radio set transmitter.

c. Internal Controls. The signal selector switch within each of the two control units permits selection of either the bell or the panel-mounted CALL LIGHT as the receiving device of audible and visual ringing signal indications, respectively.

57. Operating Procedures

The following operating procedures assume that the cable of Local Control C–434/GRC identified as SET 2 has been plugged into the audio connector on the panel of Receiver-Transmitter RT–70/GRC; that the remote and local control units have been interconnected with a suitable telephone line; and that the receiver-transmitter has been alined and placed into operation as described in chapter 3. It is recommended that the following switch settings be maintained as the normal standby switch settings of the control group. These settings will insure immediate telephone communication between the two control units and in addition prevent accidental operation of the radio set transmitter.

SELECTOR switch on Remote Control C–433/GRC in the TEL position,
REMOTE switch on Local Control C–434/GRC in the TEL ONLY position, and
LOCAL switch on Local Control C–434/GRC in the TEL position.

a. Telephone Communication With Ringing Between Control Units. For this mode of operation the setting of the OFF-ON-REMOTE CONTROL switch on Case CY–590/GRC is immaterial, since the control group is operating effectively as an independent communication circuit even though it is connected, as described above, to the radio set. Either the local or the remote operator may initiate telephone communication with a distant operator. The procedure for establishing telephone communication between the local and remote operators is as follows:

(1) *Ringing signal transmission.* The calling operator, local or remote, initiates a telephone conversation with the other operator by transmitting a ringing signal from his unit. To do this, crank the ringing generator handle mounted on the control unit panel. Outgoing ringing signal can be heard in the headphone of the transmitting operator.

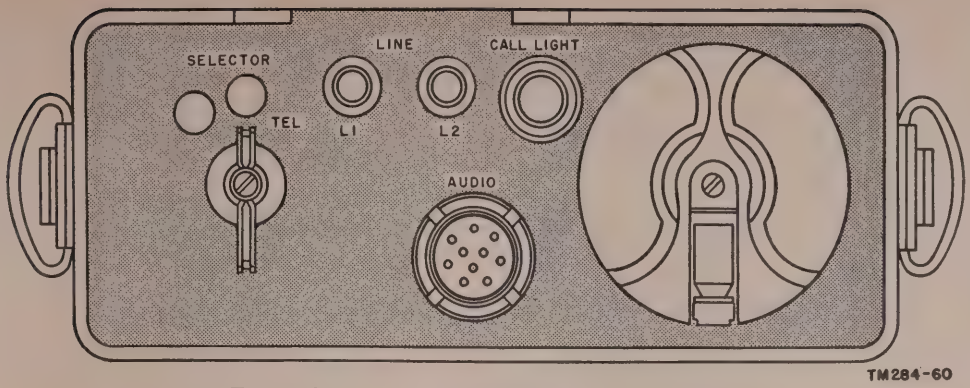


Figure 25. Panel view of remote control unit.

(2) *Ringing signal reception.* A ringing signal may be received at either control unit at any time. The signal may be heard in the earpiece of the receiving operator's handset or, depending on the setting of the internal switch, the bell may ring or the CALL LIGHT may be lit. Turn the dimmer control on the face of the lamp on the panel to reduce or eliminate the glow of the lamp.

(3) *Talking and listening.* With the control switches of the two control units set as indicated above, simply close the microphone push-to-talk switch to talk, and release the microphone push-to-talk switch to listen.

(4) *End of conversation.* To return the circuit to the stand-by condition, simply release the microphone push-to-talk switches.

b. Push-To-Talk Operation From Remote Control C–434/GRC With Local Control of Radio Set Power. The procedure is as follows:

(1) At the radio set location, turn the OFF-ON-REMOTE CONTROL switch on Case CY–590/GRC to the ON position.

(2) Set the REMOTE switch on the local control unit to the SET 2 position.

(3) At the remote control unit, set the SELECTOR switch to the left-hand write-in position and momentarily operate the microphone push-to-talk switch.

(4) Now operate the microphone push-to-talk switch in order to talk and release the microphone push-to-talk switch to listen.

(5) At the end of the conversation, release the microphone push-to-talk switch, return the SELECTOR switch to the TEL position, and return the REMOTE switch to the TEL ONLY position to return the control group to the stand-by condition.

c. Remote Push-to-Talk Operation of the Radio Set with Remote Control of Radio Set Power. For this mode of operation the local installation may be left unattended after the following switch settings have been made.

(1) At the radio set installation, turn the ON-OFF-REMOTE CONTROL switch on Case CY–590/GRC to the REMOTE CONTROL position.

(2) At the local control unit, place the REMOTE switch in the SET 2 position.

(3) At the remote control unit, turn the SELECTOR switch to the left-hand write-in position.

(4) Momentarily press the push-to-talk switch on the handset of the remote control unit. The circuit now is ready for operation.

(5) To talk, operate the push-to-talk switch. To listen, release the push-to-talk switch.

(6) At the end of this operation, turn off power from the remote unit by releasing the push-to-talk switch, turning the SELECTOR switch to the right-hand write-in position, and then momentarily operating the microphone push-to-talk switch again.

Note. The procedure of the preceding step turns off power for the radio set but leaves control of turning power on or off at the remote control unit. The use of the left-hand write-in position as an *on* position and a right-hand write-in position as an *off* position is based on the assumption that the line wires have been

connected so that line binding post L1 on the local control unit is connected to the line binding post L1 on the remote control unit, and that the line binding posts L2 on the two units are similarly connected. If the line connections are reversed, the functions of the two write-in positions will be reversed.

(7) To restore the telephone circuit to stand-by, set the REMOTE switch in the TEL ONLY position and the SELECTOR switch in the TEL position.

d. Push-To-Talk Operation from Local Control C–34/GRC. The procedure for push-to-talk operation from the local unit is as follows:

Note. The LOCAL switch of the local control unit is used as the push-to-talk switch for all push-to-talk operations from the local control unit.

(1) Turn the OFF-ON-REMOTE CONTROL switch on Case CY–590/GRC to the ON position.

Caution: Unless remote control of power is desired, never leave the OFF-ON-REMOTE CONTROL switch on Case CY–590/GRC in the REMOTE CONTROL position, otherwise the battery life will be shortened.

(2) Turn the REMOTE switch on the local control unit to the SET 1 & 2 position.

(3) Hold the LOCAL switch in the SET 2 position (spring return).

(4) Operate the microphone push-to-talk switch to talk over the radio set transmitter.

(5) Release the LOCAL switch to receive a reply over the radio set transmitter.

(6) At the end of conversation, restore the circuit to standby by turning the LOCAL switch to TEL and the REMOTE switch to TEL ONLY.

e. Monitoring Operations at Local Control C–434/GRC.

(1) The monitoring facilities available to the local operator are outlined below. With the REMOTE switch in any position, except the TEL ONLY position, the local operator can hear the output of the receiver of the radio set.

(2) The local operator cannot monitor directly the transmission of the remote operator over the radio set. However, the sidetone speech signals routed from the transmitter portion to the receiver portion of Receiver-Transmitter RT–70/GRC will be heard in the headset of the local operator.

(3) The local operator can monitor simultaneously, the output of the receiver of the radio set and speech from the remote operator, provided that the remote control unit SELECTOR switch is in the TEL position and the LOCAL switch of the local control unit is in the TEL position. This is true for any position of the REMOTE switch, except the TEL ONLY position.

f. Stopping Procedure. Power may be removed from the radio set from the control group positions as follows:

(1) To shut off power from the local position, simply turn the ON-OFF-REMOTE CONTROL switch on Case CY–590/GRC to the OFF position.

(2) To shut off power from the remote position at any time when remote power and push-to-talk control is involved, turn the SELECTOR switch to the right-hand write-in position and operate the microphone push-to-talk switch momentarily. This procedure will turn off power at the radio set. Restore the control group to stand-by condition by turning the SELECTOR switch at the remote unit and the REMOTE switch at the local unit to the TEL and TEL ONLY positions, respectively.

(3) To disconnect the control group from the radio set, turn the switch on Case CY–590/GRC to the OFF position, disconnect the line and the audio accessories, and disconnect the local control unit cable from the audio connector on the receiver-transmitter panel.

(4) When temporarily not in use, store the component of the control group in Bag CW–189/GR. This bag will accommodate both control units and the handset.

Caution: If the control group is to remain idle for any period of time, remove the batteries before storing the units.

58 Theory of Operation

(figs. 30, 31, 32, and 36)

The theory of operation of Control Group AN/GRA–6, described below, is limited to a discussion of system interconnection and circuit details. It is based on the power distribution and control circuits (fig. 36) and the schematic diagrams of the local and remote control units and of Handset H–33/PT (figs. 30, 31, and 32, respectively). For a detailed description of the circuits of Control Group AN/GRA–6, refer to the technical manual supplied with it. The legend and index references given in the following discussion are the same as those discussed in paragraph 35.

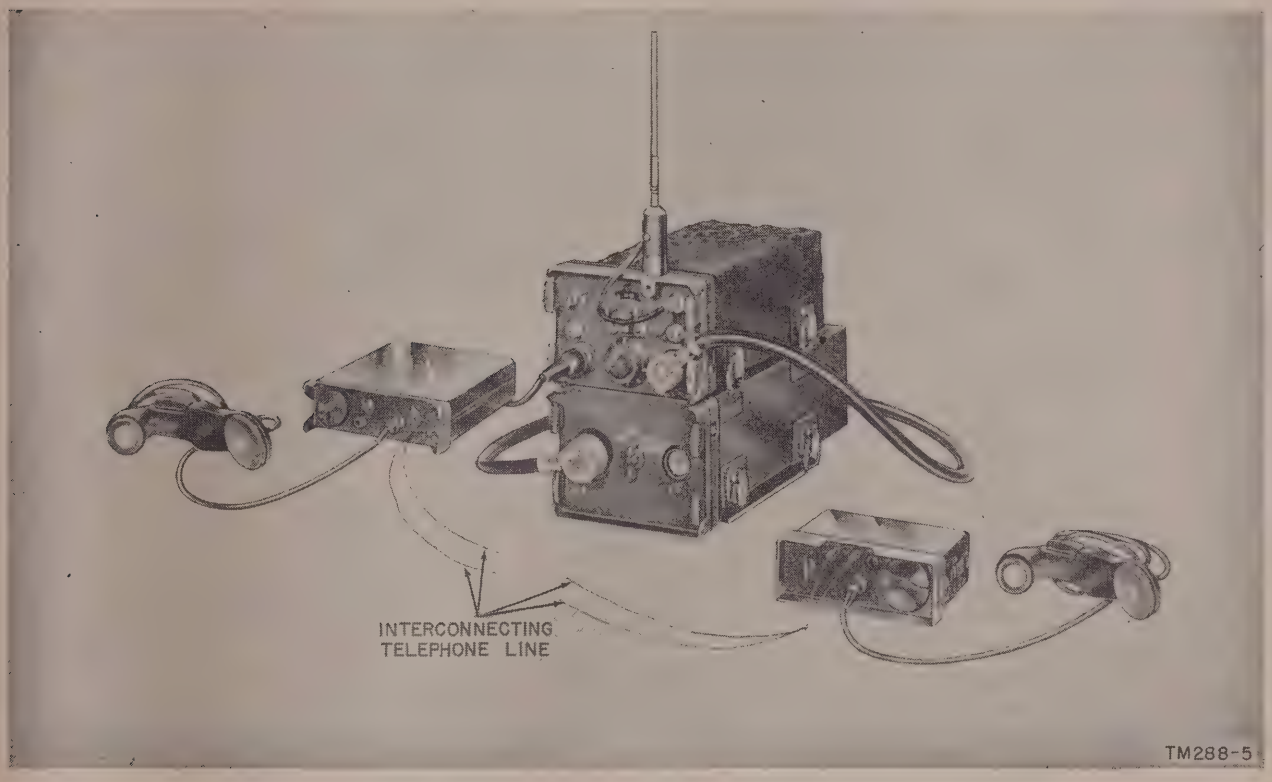


Figure 26. Operation of Radio Set AN/PRC–16 with Control Group AN/GRA–6.

a. General. When Control Group AN/GRA–6 is connected to the receiver-transmitter (fig. 26), push-to-talk operation is possible from the panel of either the local or remote control unit. Power control can be extended to the remote unit also. Ringing and telephone facilities also are provided.

b. Ringing Circuits. It is always possible to ring from Local Control C–434/GRC to the Remote Control C–433/GRC or vice-versa when the units are connected by a telephone pair. If the control group is connected to the radio set, the REMOTE switch N/S–2 (G,11; G,12; I,15; and I,16) should be in the TEL ONLY position. LOCAL switch N/S–3 (I,9) should be in the TEL position, and SELECTOR switch M/S–2 (D,11) should be in the TEL position. The ringing signal is generated by the hand generator at either unit and is transmitted in either direction through transformers N/T–1 (G,15) and M/T–1 (F,15) and the telephone line. The ringing signal operates either the CALL LIGHT on the panel of the receiving unit or the bell within the receiving unit (H,12 or D,12). An internal switch, N/S–1 or M/S–1, selects the lamp or bell in Local Control C–434/GRC and Remote Control C–433/GRC, respectively.

c. Telephone Circuit. Duplex telephone operation is possible provided the LOCAL switch (N/S–3) is left in the TEL position. Local batteries (BT–1 and BT–2) are supplied in each unit in series with the microphone (H,07 and C,13). If the push-to-talk switch on the handset or chest set at either unit is pressed, and the operator talks into the mouthpiece, the voice signals will be coupled through the transformers and telephone

line to the earphones (F,14 and J,14) at the receiving end. The TEL ONLY position of the REMOTE switch on Local Control C–434/GRC and the TEL position of the SELECTOR switch on the Remote Control C–433/GRC provide for telephone operation only. For other positions of these switches, radio operation is also possible.

d. Push-to-Talk Operation from Local Unit.

(1) The equipment may be operated from the local unit with the ON-OFF-REMOTE CONTROL switch on Case CY–590/GRC in either the ON position when local control of power is desired, or in the REMOTE CONTROL position when control of power from Remote Control C–433/GRC is desired. In the latter cases, the radio set may be left unattended after the initial switch settings have been made, since the distant operator can turn power off when no transmission or reception is desired. If the switch is at ON, the power circuits are exactly as described in paragraph 36. If the switch is on REMOTE CONTROL, the ground return for the 7.5-volt batteries is completed through the REMOTE CONTROL position of S/S–1 (F,01), Power Cable Assembly CX–1209/U, and the SET 1&2 position of N/S–2.

Note. Ordinarily, the REMOTE CONTROL position is not used for operation from the local control unit.

(2) The receiver output is supplied to the earpiece of a headset at the local unit (J,14) through terminals C/J–202A, and N/P–2A, and section 2F front of switch N/S–2 (I,10). The monitoring circuit is broken when the switch is placed in the TEL ONLY position.

(3) The transmit-control and microphone lines are completed when the LOCAL switch (H,08) is held in the SET 2 position and the push-to-talk switch of the handset (J,07) is pressed. The circuit for transmit-control relay C/O–101 (E,09) is completed through section 1B of the LOCAL switch (H,09). The circuit to microphone transformer C/T–1 (E,07) is completed through section 1C of the LOCAL switch (H,08) and the push-to-talk switch (J,08). Talking into the microphone causes modulation of the receiver-transmitter.

e. Remote Control Facilities (figs. 30 and 31).

(1) Field operation from the remote control unit includes power control as well as push-to-talk control. The OFF-ON-REMOTE CONTROL switch of the battery box (F,01) is set in the REMOTE CONTROL position, and the REMOTE switch (I,02, G,07, and H,11) is placed in the SET 2 position. Power and push-to-talk circuits are then under control of relays N/O–1, N/O–2, and N/O–3 (G,11, G,10, and I,11, respectively). The SELECTOR switch (E,11) and push-to-talk switch (D,11) at the remote unit controls operation of the relays.

(2) When the SELECTOR switch is placed in the left-hand write-in position and the push-to-talk switch is pressed, relays N/O–1, N/O–2, and N/O–3 will be energized. Contacts 4–6 of relay N/O–3 (I,02) will close to complete the ground line for the 7.5-volt filament batteries. When the push-to-talk button is released, the contacts will remain closed and the receiver will be completely operative. Power distribution to plate and filament circuits is the same as described in pars. 37 and 38. The position of contacts 7–6 of relay N/O–2 (G,10) is not changed, since the potential applied to the relay is of the wrong polarity to cause operation of the contacts. Contacts of relay N/O–1 will operate as long as the push-to-talk switch is closed. Their function is discussed under transmission in (4) below.

(3) The receiver output is coupled through section 2F front of the REMOTE switch (I,11), transformer M/T–1 (I,15), the telephone line, and transformer M/T–1 (F,15) to the earpiece of the handset at the remote unit.

(4) When the push-to-talk switch is held, contacts 7–6 of relay N/O–1 (H,09) complete the ground return for transmit-control relay C/O–101; contacts 4–6 open to prevent feedback from the receiver to the remote unit; contacts 5–8 of the relay (G,07) and the push-to-talk switch (I,07) complete the microphone circuit to ground. Talking into the microphone

causes modulation of the transmitter as previously described.

(5) To remove power from the receiver-transmitter it is necessary to place the SELECTOR switch in the right-hand write-in position and momentarily press the push-to-talk switch. Contacts 4–6 of relay N/O–3 (I,02) will then open the ground line for the 7.5-volt battery.

59. Trouble Shooting at Organizational Maintenance Level

a. Scope. The trouble shooting and repair work that can be performed at the organizational maintenance level (operators and repairmen) is necessarily limited in scope by the tools, test equipment, replaceable parts issued, and by the existing tactical situation. Accordingly, trouble shooting is based on the performance of the equipment and the use of the senses in determining such troubles as burned-out call light, obviously broken or damaged parts, and the like. The paragraphs which follow in this section will help to determine which of the components of the control group (such as Local Control C–434/GRC, Remote Control C–433/GRC, and Handset H–33/PT), the telephone line, or the associated radio set are at fault and help to localize the fault in a control group component to the defective circuit section or item.

b. Visual Inspection. Visual inspection is the first step in trouble shooting on an organizational level. Many troubles with the equipment can be discovered merely by looking over the equipment and noting an obviously damaged, dirty, or corroded part.

c. Equipment Performance Checklist.

(1) *General.* The equipment performance checklist given in table IV below will help the operator to locate trouble in the equipment. This list gives the item number, the item to be checked, the action to be taken, the normal indication, and the possible source of trouble.

(2) *Action or condition.* For some items, the information given in the action or condition column consists of various switch settings under which the item is to be checked. For other items, it represents an action to be taken to check the normal indication given in the normal indications column.

(3) *Normal indications.* The normal indications listed include the visible and audible signs that the operator should perceive when he checks the item. If the indications are not normal, the operator should apply the recommended corrective measures.

(4) *Corrective measures.* The corrective measures listed are those that the operator can make without turning in the equipment for repairs. If the equipment is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained, and if the equipment is not completely operative, the operator must maintain the equipment as long as is possible to do so. Detailed trouble-shooting data are given in a separate technical manual for Control Group AN/GRA–6.

Note. Before performing the actions called for in the checklist, check to see that the installation of the equipment has been made properly. Refer to paragraph 54 for detailed installation instructions.

Section II. CHEST SET GROUP AN/GSA–6 AND HEADSET-MICROPHONE H–63/U

60. Purpose and Use

The combination of Chest Set Group AN/GSA–6 and Headset-Microphone H–63/U may be used as the audio device with Control Group AN/GRA–6 or with the receiver-transmitter of Radio Set AN/PRC–16 to provide the equivalent of a handset with push-to-talk switch. In operation, the chest set is strapped to the body, and the headset-microphone assembly is fitted on the head of the operator.

61. Description

(figs. 27, 28, and 32)

a. Chest Set Group AN/GSA–6. Chest Set Group AN/GSA–6 consists of a chest-mounting switch box and a 5-foot cord which terminates in

Table IV. Equipment performance checklist for control group AN/GRA–6

Item No.	Unit	Item	Action or condition	Normal indication	Possible defective unit
1	Local control unit	Generator	Crank generator and listen in earpiece of handset.	Ringing signal is heard in earpiece.	Local control unit or handset.
2	Local control unit	Generator (and BELL-LAMP switch in remote unit).	At remote control unit, operate internal BELL-LAMP switch to BELL. At local control unit, crank generator.	Ringing signal is heard at remote control unit.	Remote control unit or telephone line.
3	Local control unit	Generator (and BELL-LAMP switch in remote unit).	At remote control unit, operate internal BELL-LAMP switch to LAMP. Open dimmer control. At local control unit, crank generator.	CALL LIGHT glows at remote control unit.	Remote control unit call light circuit. Replace E–3 and repeat this check.
4	Remote control unit	SELECTOR switch and push-to-talk switch on handset.	Turn to TEL. Press push-to-talk switch on handset. Talk into mouthpiece and acknowledge call (item 3). Listen in headphones.	Local operators hears remote operator. Remote operator hears sidetone in own earpiece.	Remote control unit (BT–1 or BT–2). Local control unit.
5	Remote control unit	Generator	Crank generator and listen in headphone.	Ringing signal is heard in headphone.	Remote control unit or handset.
6	Remote control unit	Ringing signal circuits	At local control unit operate BELL-LAMP switch to BELL. At remote control unit crank generator.	Ringing signal is heard at local control unit.	Local control unit bell.
7	Remote control unit	Ringing signal circuits	At local control unit operate BELL-LAMP switch to LAMP. Open dimmer control. At remote control unit crank generator.	CALL LIGHT glows at local control unit.	Local control unit call light circuit. Replace E–3 and repeat this check.
8	Local control unit	REMOTE switch	Turn to TEL ONLY position. Press push-to-talk switch on microphone. Talk into microphone and acknowledge call (item 7). Listen in headphones.	Remote operator hears local operator's speech.	Local control unit. Check battery voltage and/or replace with good batteries. Check whether batteries are installed properly.

9	Local control unit	LOCAL switch	Turn ON-OFF-REMOTE CONTROL switch on Case CY–590/ORC to ON. Hold LOCAL switch in SET 2 position. Operate microphone push-to-talk switch. Talk into microphone. Release both switches when finished.	Transmitter is turned on. Sidetone is heard in operator's own headphones.	Local control unit or radio set.
10	Local control unit	REMOTE switch	Turn to SET 1 & 2 position		
11	Remote control unit	SELECTOR switch and handset.	Turn to right-hand write-in position. Press push-to-talk switch and talk into microphone.	Transmitter is turned on	Remote control unit. Local control unit.
12	Local control unit	REMOTE switch	Turn ON-OFF-REMOTE CONTROL switch on battery box to REMOTE. Turn to SET 2 position. (Remote control unit SELECTOR switch in left-hand write-in position, push-to-talk switch unoperated.)	Power for radio set is off	Handset at remote unit.
13	Local control unit	REMOTE switch	Turn to SET 2 position	Power for radio set stays off	Local control unit or radio set.
14	Remote control unit	SELECTOR switch and handset.	Turn to left write-in position and operate push-to-talk switch.	Power for radio set is turned on. Set 2 transmitter goes on.	Remote control unit, handset, local control unit, or radio set.
15	Remote control unit	SELECTOR switch and handset.	Turn to right-hand write-in position and operate push-to-talk switch momentarily.	Power for radio set is turned off. Set 2 is turned off.	Local control unit.
16	Remote and local control units.	Control switches	Turn SELECTOR switch to TEL. Turn REMOTE switch to TEL ONLY.		

an 8-contact receptacle and a 10-pin AUDIO plug. The receptacle mates with the plug on one end of the switch box and provides a quick-disconnect feature for the chest set. The AUDIO plug will mate any one of the 10-pin AUDIO receptacles on the local and remote control units and on the receiver-transmitter. Two plugs provided on the switch box will mate with the jacks of the Headset-Microphone H–63/U. Two push-to-talk buttons are provided on one side of the switch box; a push-button RADIO-INT switch is provided on the other side of the box. The push-to-talk buttons are electrically identical, but one provides momentary contact and the other locks in position. The lock-on button may be disabled by means of an internal adjustment (fig. 28) when desired. The RADIO-INT switch is a momentary type switch, normally in the INT position. An internal adjustment is provided (fig. 28) to lock the switch in either the RADIO or INT position. For use with Radio Set AN/PRC–16 or with the Local Control C–434/GRC when operating as part of a field telephone set, the switch should be locked in the RADIO position.

b. Headset-Microphone H–63/U. Headset-Microphone H–63/U (fig. 29) consists of two series-connected 300-ohm receivers and a 40-ohm microphone. The microphone is mounted on an adjustable boom attached to the receiver headband. Two 14-inch conductors from the microphone and headset are terminated in two-pin and three-pin jacks, respectively. These jacks will mate with the plugs on Chest Set Group AN/GSA–6.

62. Installation and Operation

a. Unpacking. The chest set group and the handset group, when supplied with Radio Set AN/PRC–16 and/or with Control Group AN/GRA–6 as auxiliary equipment, will not be required until the radio set and/or the control group is ready for an operational test. Take the usual precautions against damage to the equipment dur-

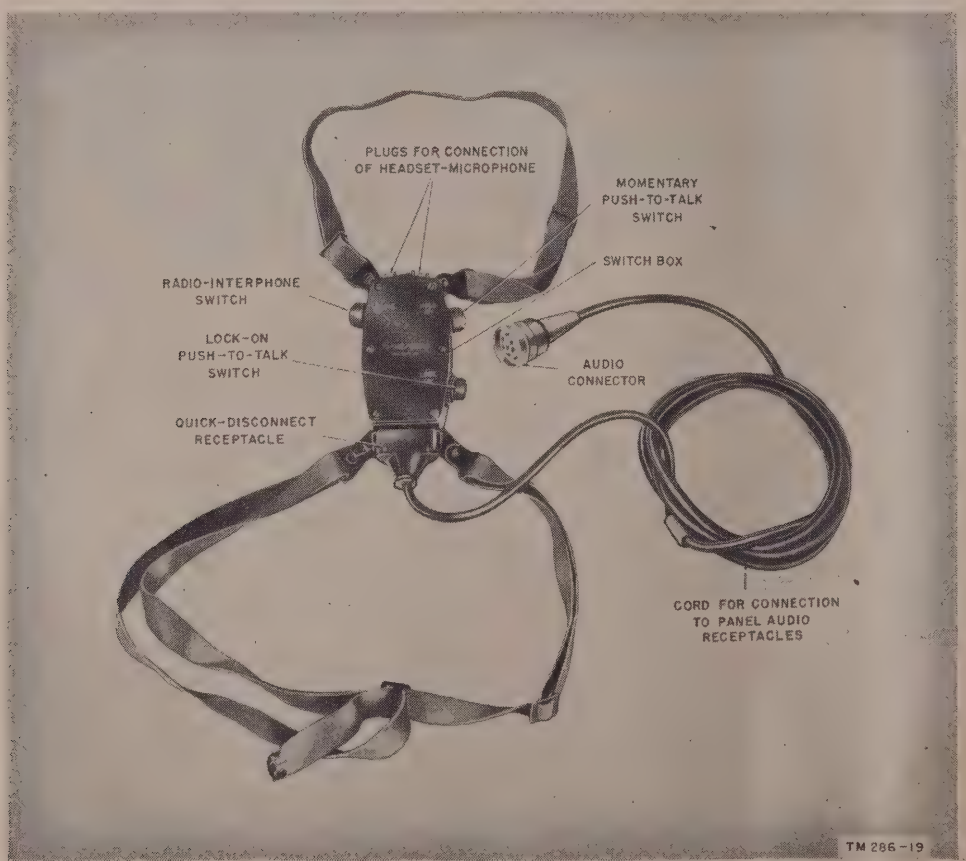


Figure 27. Chest Set Group AN/GSA–6.

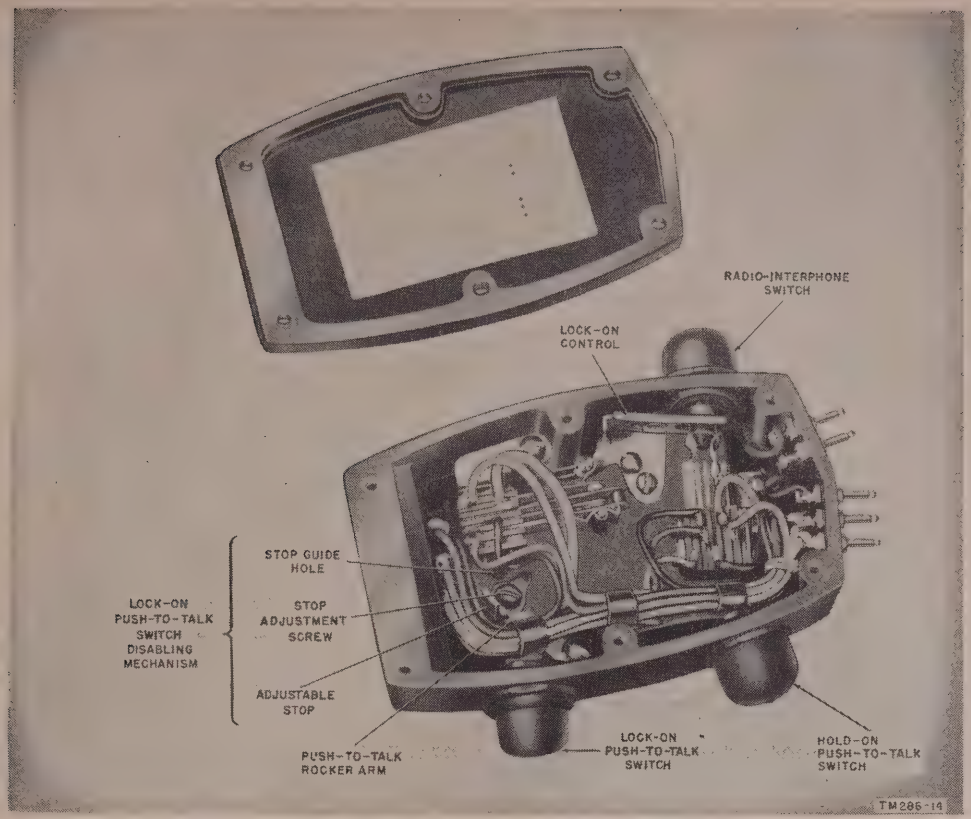


Figure 28. Chest Set Group AN/GSA–6, internal view.

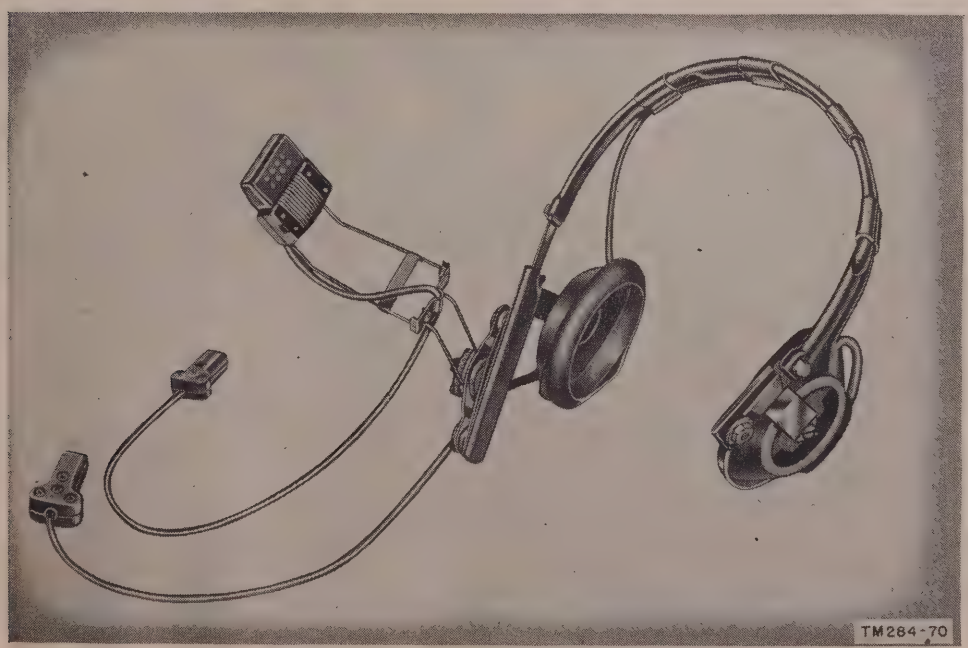


Figure 29.—Headset-Microphone H–63/U.

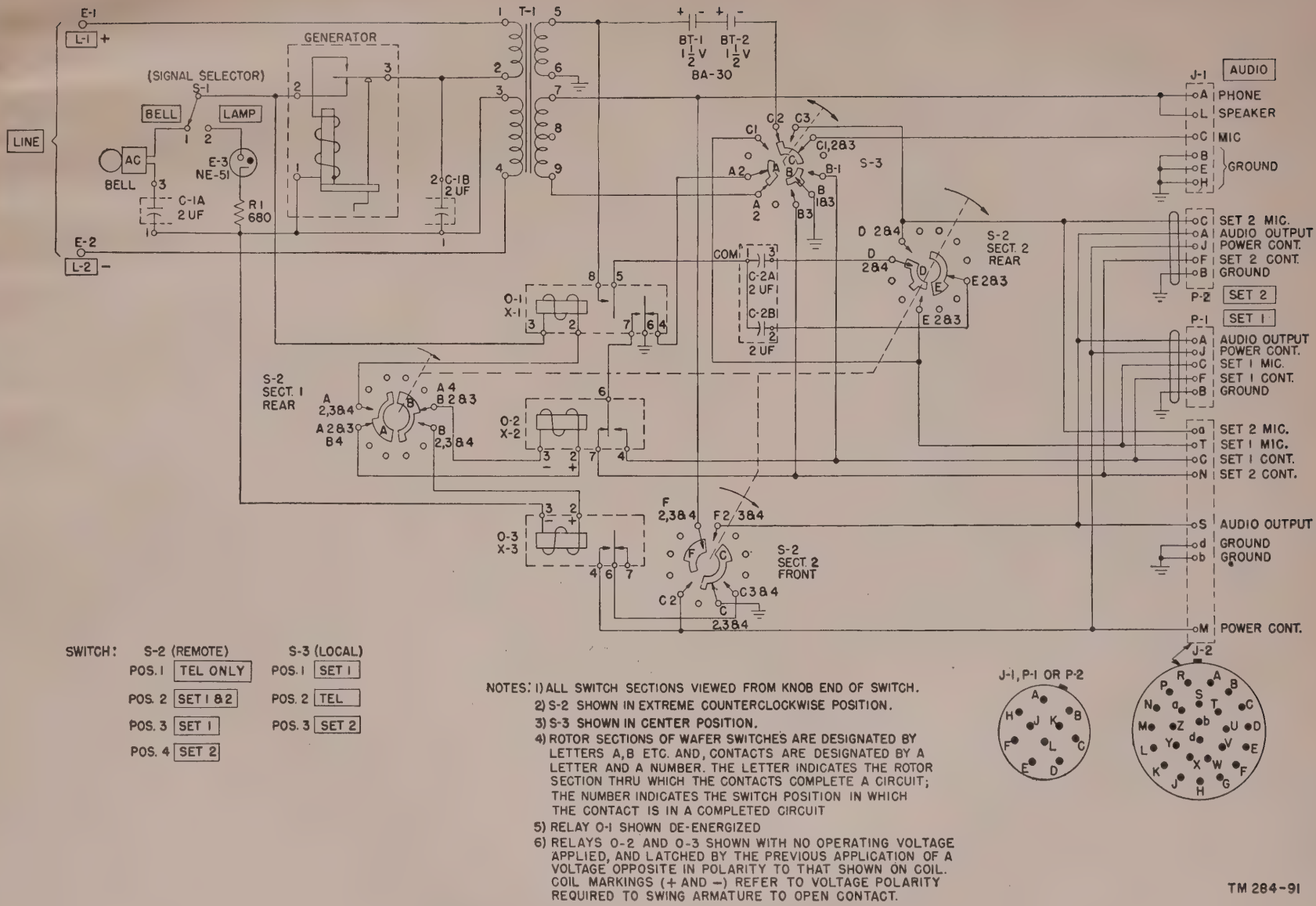
ing unpacking procedure. The points of procedure outlined in paragraph 14 should be observed whenever possible. After unpacking, the chest set and headset-microphone should be stored away until needed.

b. Disposition. The specific disposition and usage of the chest set and the headset-microphone, in part, depends on specific conditions and modes of operation. The chest set and the headset-microphone always should be used together, at the AUDIO receptacles of the receiver-transmitter, and, when Control Group AN/GRA–6 is used, at the local control unit.

c. Switch Settings.

(1) When the chest set is used with the receiver-transmitter, the lock-on push-to-talk switch should be disabled by moving the internal adjustable stop (fig. 28) against the push-to-talk rocker arm. To move the stop, remove the switch box cover, loosen the stop adjustment screw, lift and turn the stop until the pin on the stop engages the stop guidehole, and retighten the screw.

(2) The RADIO-INT switch should be locked in the RADIO position. To lock the switch, remove the cover of the switch box, press the RADIO-INT button, and slide the lock-on control toward the switch (fig. 28) to hold the button depressed.



SWITCH: S-2 (REMOTE) S-3 (LOCAL)

	S-2 (REMOTE)	S-3 (LOCAL)
POS. 1	TEL ONLY	SET 1
POS. 2	SET 1 & 2	TEL
POS. 3	SET 1	SET 2
POS. 4	SET 2	

NOTES:
1) ALL SWITCH SECTIONS VIEWED FROM KNOB END OF SWITCH.
2) S-2 SHOWN IN EXTREME COUNTERCLOCKWISE POSITION.
3) S-3 SHOWN IN CENTER POSITION.
4) ROTOR SECTIONS OF WAFER SWITCHES ARE DESIGNATED BY LETTERS A, B ETC. AND, CONTACTS ARE DESIGNATED BY A LETTER AND A NUMBER. THE LETTER INDICATES THE ROTOR SECTION THRU WHICH THE CONTACTS COMPLETE A CIRCUIT; THE NUMBER INDICATES THE SWITCH POSITION IN WHICH THE CONTACT IS IN A COMPLETED CIRCUIT
5) RELAY O-1 SHOWN DE-ENERGIZED
6) RELAYS O-2 AND O-3 SHOWN WITH NO OPERATING VOLTAGE APPLIED, AND LATCHED BY THE PREVIOUS APPLICATION OF A VOLTAGE OPPOSITE IN POLARITY TO THAT SHOWN ON COIL. COIL MARKINGS (+ AND −) REFER TO VOLTAGE POLARITY REQUIRED TO SWING ARMATURE TO OPEN CONTACT.

Figure 30. Local Control C–434/GRC, schematic diagram.

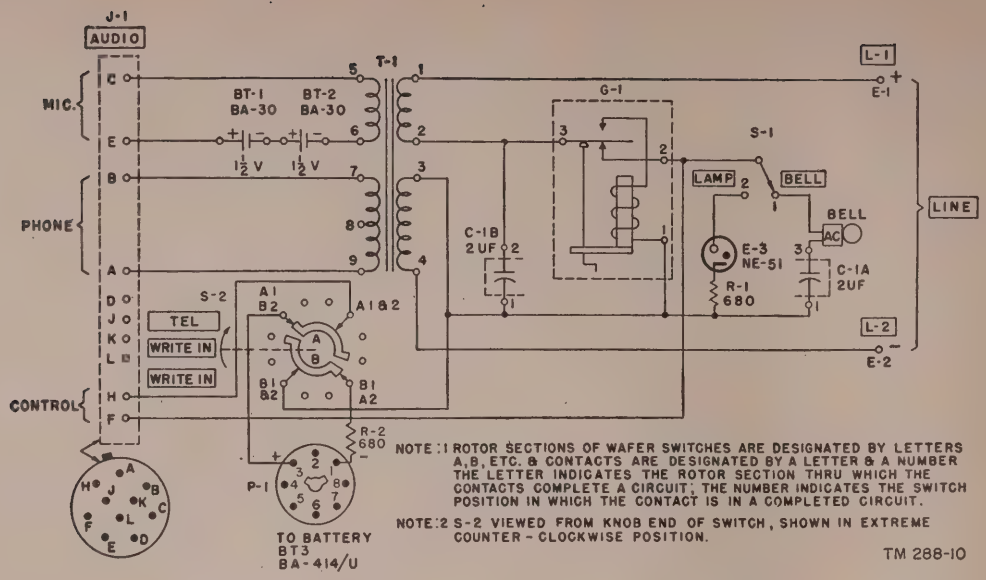


Figure 31. Remote Control C-433/GRC, schematic diagram.

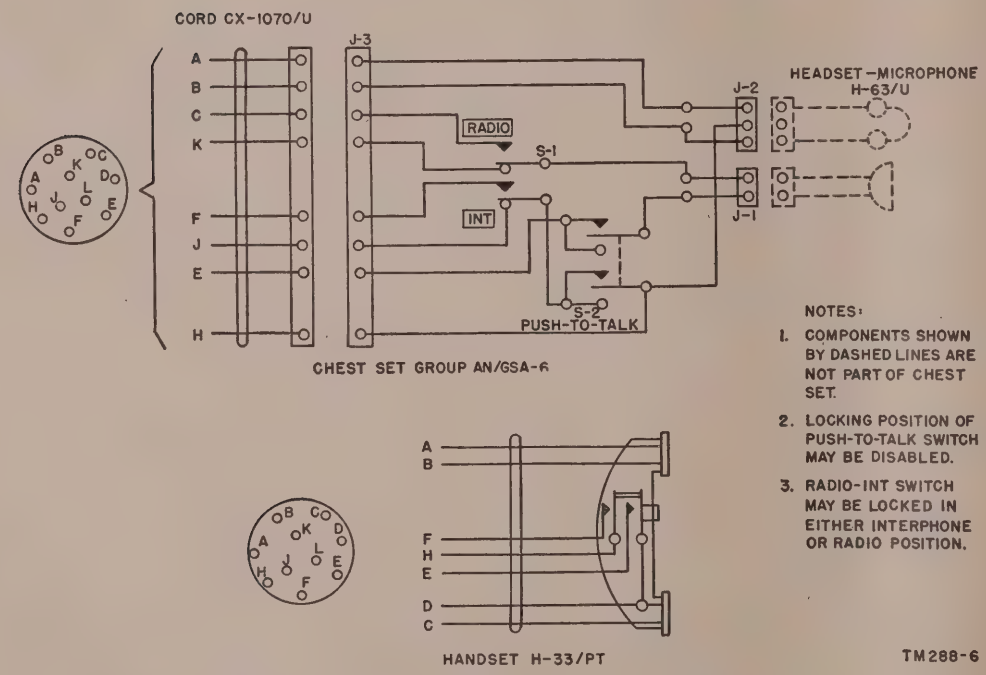


Figure 32. Audio accessories, schematic diagram.

CHAPTER 7

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

63. Disassembly

The following instructions are recommended as a guide for preparing the radio set for transportation and storage. Reverse the order followed in the paragraphs referred to.

a. Control Group AN/GRA–6.

(1) Disconnect the telephone line, and wind on a reel (par. 54).

(2) Remove the batteries from Local Control C–434/GRC (par. 54).

(3) Remove the batteries from Remote Control C–433/GRC.

(4) Disconnect plug P–1 of Local Control C–434/GRC from the receiver-transmitter (if connected), and store the cord in the compartment provided for it at the rear of the unit.

b. Disconnection of Cables.

(1) Disconnect all audio accessories from their receptacles on the units, and coil the cords neatly.

(2) Disconnect Power Cable Assembly CX–1209/U between the units (par. 15).

(3) Disconnect the antenna cable from the receiver-transmitter.

c. Removal of Units.

(1) Remove the receiver-transmitter from either the mounting or from atop the battery case (par. 15).

(2) Remove the battery case from the mounting.

d. Removal of Mounting. Remove Mounting MT–673/UR from the mounting surface or surfaces.

e. Removal of Antenna.

(1) Remove the antenna mast sections from the mounting (par. 15).

(2) Remove Mounting MT–652/GR from the receiver-transmitter.

64. Repacking for Shipment or Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends on the material available and the conditions under which the equipment is to be shipped or stored. Refer to paragraphs 14 and 54 and reverse the instructions given in those paragraphs.

b. Whenever practicable, place a dehydrating agent such as silica gel inside the chests. Protect the chests with a waterproof paper barrier. Seal the seams of the paper barrier with waterproof sealing compound or tape. Pack the protected chests in padded wooden case, providing at least 3 inches of excelsior padding or some similar material between the paper barrier and the packing case.

Section II. DEMOLITION OF MATÉRIEL TO PREVENT ENEMY USE

65. General

The demolition procedures outlined in paragraph 66 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon order of the commander.

66. Methods of Destruction

a. Smash. Smash the crystals, controls, tubes, coils, switches, capacitors, transformers, microphones, and headsets, using sledges, axes, handaxes, pickaxes, hammers, crowbars, or heavy tools.

b. Cut. Cut cords, cables, headsets, and wiring, using axes, handaxes, machetes, or bayonets.

c. Burn. Burn cords, cables, resistors, capacitors, coils, wiring, and technical manuals, using gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. Bend. Bend panels, cases, chassis, mounting, and antenna mast sections.

e. Explosives. If explosives are necessary, use firearms, grenades, or TNT.

f. Disposal. Bury or scatter the destroyed parts in slit trenches, fox holes, or other holes, or throw them into streams.

g. DESTROY EVERYTHING.

APPENDIX I

REFERENCES

Note. For availability of items listed, check SR 310–20–3 and SR 310–20–4. Check Department of the Army Supply Catalog SIG 1 for Signal Corps supply catalog pamphlets.

1. Army Regulations

AR 380–5___. Safeguarding Military Information.

2. Supply Publications

SIG 1_____ Introduction and Index.
SIG 3_____ List of Items for Troop Issue.
SB 11–6____ Dry Battery Supply Data.
SB 11–47___ Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11–76___ Signal Corps Kit and Materials for Moisture and Fungi-Resistant Treatment.

3. Publications on Auxiliary Equipment and Test Equipment

TM 11–300__ Frequency Meter Sets SCR–211–(*).
TM 11–303__ Test Sets I–56–C, I–56–D, I–56–H, and I–56–J.
TM 11–307__ Signal Generators I–72–G, H, J, and K.
TM 11–321__ Technical Manual for Test Set I–56–E.
TM 11–472__ Repair and Calibration of Electrical Measuring Instruments.
TM 11–2613_ Voltohmmeter I–166.
TM 11–2626_ Test Unit I–176.
TM 11–2627_ Tube Tester I–177.

4. Painting, Preserving, and Lubrication

TB SIG–13_. Moistureproofing and Fungiproofing Signal Corps Equipment.
TM 9–2851__ Painting Instructions for Field Use.

5. Camouflage

FM 5–20____ Camouflage, Basic Principles.

6. Decontamination

TM 3–220___ Decontamination.

7. Demolition

FM 5–25____ Explosives and Demolitions

8. Other Publications

FM 24–18___ Field Radio Techniques.
FM 72–20___ Jungle Warfare.
SR 310–20–3. Index of Training Publications (Field Manuals, Training Circulars, Firing Tables and Charts, Army Training Programs, Mobilization Training Programs, Graphic Training Aids, Joint Army-Navy-Air Force Publications, and Combined Communications Board Publications).
SR 310–20–4_ Index of Technical Manuals, Technical Regulations, Technical, Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Tables of Allowances, Tables of Organization, and Tables of Equipment.
SR 700–45–5_ General Unsatisfactory Equipment Report (Reports Control Symbol CSGLD–247).
SR 745–45–5_ Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD–66 (Army).)

TB SIG 4___ Methods for Improving the Effectiveness of Jungle Radio Communication.
TB SIG 5___ Defense Against Radio Jamming.
TB SIG 25__ Preventive Maintenance of Power Cords.
TB SIG 54__ Working Through Jamming with Frequency Modulated Radio Sets.
TB SIG 66_ Winter Maintenance of Signal Equipment.
TB SIG 72__ Tropical Maintenance of Ground Signal Equipment.
TB SIG 75__ Desert Maintenance of Ground Signal Equipment.
TB SIG 123_ Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178_ Preventive Maintenance Guide for Radio Communication Equipment.
TB SIG 223_ Field Expedients for Wire and Radio.
TB 11–499___ ( )* Basic Radio Propagation Predictions.
TM 9–2857___ Storage Batteries Lead-Acid Type.
TM 11–310___ Schematic Diagrams for Maintenance of Ground Radio Communication Sets.
TM 11–314___ Antennas and Antenna Systems.
TM 11–415___ Dry Batteries.
TM 11–430___ Batteries for Signal Communication. Except those pertaining to Aircraft.
TM 11–453___ Shop Work.
TM 11–455___ Radio Fundamentals.
TM 11–466___ Radar Electronic Fundamentals.
TM 11–476__ Radio Direction Finding.
TM 11–483__ Suppression of Radio Noises.
TM 11–486__ Electrical Communication Systems Engineering.
TM 11–499__ (Preliminary) Radio Propagation Handbook.
TM 11–660__ Introduction to Electronics.
TM 11–4000_ Trouble Shooting and Repair of Radio Equipment.
TM 38–650__ Basic Maintenance Manual.

*A new TB in this series is issued monthly which gives propagation predictions 3 months in advance.

9. Abbreviations

ac_____ alternating current.
af_____ audio frequency.
afc_____ automatic frequency control.
C_____ centigrade.
db_____ decibel(s).
dc_____ direct current.
F_____ Fahrenheit.
f-m_____ frequency-modulation.
hf_____ high frequency.
hv_____ high voltage.
i. f_____ intermediate frequency.
lv_____ low voltage.
kc_____ kilocycle.
ma_____ milliampere.
mc_____ megacycle.
mw_____ milliwatt.
rf_____ radio frequency.
ua_____ microampere.
uf, uuf_____ microfarad, micromicrofarad.
uv_____ microvolt.

10. Glossary

For explanation of terms used in this manual, refer to TM 11–455.

APPENDIX II

IDENTIFICATION TABLE OF PARTS

1. Requisitioning Parts

The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O & E, T/A, SIG 7–8–10, list of allowances of expendable material, or another authorized supply basis. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index. Case CY–590/GRC is the only unit included in the following identification table of parts. The other units are covered in separate technical manuals.

2. Identification Table of Parts for Case Cy-590/GRC

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	ARMY-NAVY CASE CY–590/GRC: battery; aluminum, olive drab finish; 15⅝″ lg x 7¼″ wd x 5⅜″ h o/a; removable front panel has metal battery holder which slides into case; immersion and fungus resistant; 2 lock strikes on upper, 2 spring catches on lower edge of ea side; 4 positioning studs on bottom side, 4 positioning holes on top side of case; p/o Army-Navy Radio Set AN/PRC–16; Fed Tele & Rad dwg # GA–2415–14; U. S. Army spec #71–3331.		2Z1891–590
H–5 through H–8, H–9.	CATCH, fastener: p/o Army-Navy AF Amplifier AM–65/GRC and Army-Navy Case CY–590/GRC; c/o back plate, lever, 2 ea outside and inside links, 2 pins, and 2 springs; steel, zinc pl and olive drab iridite; 2 1/16″ lg x 1 7/16″ wd x ½″ d in locked position; two .144″ diam mtg holes on back plate, .437″ c to c; Fed Tele & Rad part/dwg #SC–D–20648; Sig C dwg #SC–D–20648.	H–5 through H–8: Mounting catches. H–9: Battery tray fastener catch.	6Z1747–36
	Technical Manual (TM 11–284)		(Order through AGO channels.)
	Technical Manual (TM 11–285)		(Order through AGO channels.)
	Technical Manual (TM 11–286)		(Order through AGO channels.)
	Technical Manual (TM 11–287)		(Order through AGO channels.)
	Technical Manual (TM 11–291)		(Order through AGO channels.)
P–6	CONNECTOR, plug: 8 round male cont; straight; 5 5/64″ lg x 1 3/32″ diam o/a; round black phenolic body; mts by means of keyed ctr locating pin and cont; 2 square keys on ctr locating pin 135 deg apart; Fed Tele & Rad part/dwg #ES–A–83778; Sig C dwg #ES–A–83778.	B battery connector	2Z3028–56
P–1 through P–5	CONNECTOR, plug: 8 round male cont; straight; 5 5/64″ lg x 1 3/32″ diam o/a; round black phenolic body; mts by means of keyed ctr locating pin and cont; 2 rounded keys on ctr locating pin 90 deg apart; Fed Tele & Rad part/dwg #ES–A–83777; Sig C dwg #ES–A–83777.	A Battery connectors	2Z3028–57
J–2	CONNECTOR, receptacle: 9 round female cont; cont rated 10 amp at 800 v AC; Amphenol dwg #164.3; Fed Tele & Rad part/dwg #GH–2082–12.	Generator input connector.	2Z3070–49

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
J–1	CONNECTOR, receptacle: 14 round female cont; cont rated 10 amp at 800 v AC; Amphenol dwg #164–5; Fed Tele & Rad part/dwg #GH–2083–12.	Output connector	2Z3075–26
H–1 through H–4	FASTENER, Dzus: die cast zinc and steel, olive drab finish; 1⅝″ lg x 1 5/16″ wd x 5/16″ thk o/a; mts by shaft thru ¼″ diam clearance hole; preloaded spring pressure, unlocked approx 32 lb, locked 45 lb; Dzus dwg #X–486; Fed Tele & Rad part/dwg #GA–2178–2.	Panel-to-case fasteners	6Z3809–27
O–5	GASKET, Buna N or neoprene; single hole; rectangular, 6.6″ lg x 4.85″ wd x .187″ thk; hole 6.12″ lg x 4.37″ wd; Fed Tele & Rad part/dwg #GR–1443–12–5.	Panel-to-case waterproofed gasket.	2Z4867–691
H–16 through H–19	INSERT, threaded: steel, cad pl and olive drab iridited; generally rectangular w/2 rounded corners; 2 9/32″ lg x 1 1/32″ wd x .1196″ thk; two #6–32 NC–2 tapped holes on .531″ ctr; Fed Tele & Rad part/dwg #GB–1171–2.	Strike mounting screws, retaining inserts (nuts).	2Z5400–52
H–20 through H–23	INSERT, threaded: steel, cad pl and olive drab iridited; generally rectangular W/1 rounded end; 1 1/16″ lg x ⅜″ wd x .1196″ thk; two #6–32 NC–2 tapped holes on .437″ ctr; Fed Tele & Rad part/dwg #GB–1172–2.	Catch mounting screws, retaining inserts (nuts).	2Z5400–56
E–1, E–2	INSULATOR, standoff: round post shape; natural or black grade LTS–E–4 phenolic w/electro tin pl brass term lug, and cad pl and clear iridited hex brass mtg base and stud; 13/16″ lg o/a; 600 v RMS breakdown; 5/16″ diam o/a; single #6–32 NC–2 x ¼″ lg mtg stud; Fed Tele & Rad part/dwg #GN–2198–2.	Wiring terminal posts	3G350–106
E–3	KNOB: round; w/bar; olive drab zinc alloy; for ¼″ diam double flatted shaft; single #6–32 screw thru hole in face of knob screws into tapped axial hole in end of shaft; 2 white luminous lines on bar portion; 1 1/16″ lg x ⅞″ wd x 1 15/32″ h o/a; shaft hole .359″ d from bottom surface; luminous markings; Fed Tele & Rad part/dwg #GC–1690–2.	Switch knob	2Z5822–401
N–1	LABEL: decalcomania; 4⅝″ lg x 2⅞″ wd x .007″ thk; white print on black background; individually packed; Meyer cord type G; Fed Tele & Rad part/dwg #GD–2424–12; Sig C dwg #SC–C–40596–A.	Circuit label	6D16777–11
H–10	NUT, castellated: steel, cad pl and olive drab iridited; finished per dwg; ⅜″–32 NS–2; ⅛″ thk, 9/16″ OD; 4 slots 3/32″ wd x 3/64″ d spaced 90 deg apart; Fed Tele & Rad part/dwg #GB–1106–2.	Switch mounting nut	6L3006–32S
R–2	RESISTOR, fixed: WW; 39 ohms ±10%; ½ w; JAN type RU3BR39K.	Set 2 filament-dropping resistor.	3RU02400
R–3	RESISTOR, fixed: 10 ohms ±10%; 2 w; IRC #BW–2	Set 2 relay dropping resistor.	3Z6001–146
R–1	RESISTOR, fixed: WW; 1.2 ohms ±10%; 2 w; IRC #BW–2	Set 1 filament-dropping resistor.	3Z5991B2
O–1 through O–4	SPRING: loop type; strike for Dzus fastener; .08″ diam olive drab iridited music wire; 1⅜″ lg x 5/32″ wd x .08″ thk o/a; 2 ends turned perpendicular at 90 deg angle to straight portion on 1/16″ rad; Dzus dwg #X–487; Fed Tele & Rad part/dwg #GB–2414–2.	Fastener strikes	6Z8377–10
H–11 through H–14	STRIKE, fastener: steel, cad pl and olive drab iridite; ⅞″ lg x 9/16″ wd x 1 1/32″ h o/a; two .169″ diam mtg holes, .531″ c to c; 1 edge shaped into hook on 1/16″ inside rad x 1 9/32″ wd to provide catch action; Fed Tele & Rad part/dwg #GB–3035–2.	Mounting fastener strikes.	6Z8569–4.
H–15	STRIKE, fastener: steel, electro tin pl; rectangular; 4″ lg x 1″ wd x ⅜″ h o/a; four .136″ diam mtg holes, 2 on ea end on 9/16″ x 3⅝″ mtg/c; ctr portion raised and has five ⅛″ x 9/16″ slots; Fed Tele & Rad part/dwg #GB–1762–2.	Battery tray fastener strike.	6Z8569–6

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
S–1	SWITCH, rotary: 2 pole, 3 position; single sect; silver pl brass cont; ceramic wafer; 1⅞″ lg x 1⅝″ wd x $^{29}/_{32}$″ d from mtg surface; nonshorting cont; locking action; solder lug term; single hole mtg, ⅜″–32 x ⅜″ lg mtg bushing, shaft ¼″ diam x $^{11}/_{16}$″ lg from mtg surface; Oak type #HIC; Fed Tele & Rad part/dwg #GH–2097–2.	OFF-ON REMOTE CONTROL switch.	3Z9825–62.531

APPENDIX III

RELATED RADIO SETS

1. Basis of Relationship

The major components of the radio sets discussed in this manual are common to numerous other sets which utilize common or overlapping frequency ranges. The frequency spectrum chart (fig. 2) indicates how the sets are related insofar as frequency coverage is concerned. Physical similarities among the sets are indicated in the comparison chart following and in figure 37.

2. Comparison Chart

The following chart lists the components of the radio sets discussed in this manual and the components of related radio sets. Analysis of the chart will reveal the high degree of similarity which exists among the sets.

Radio Sets

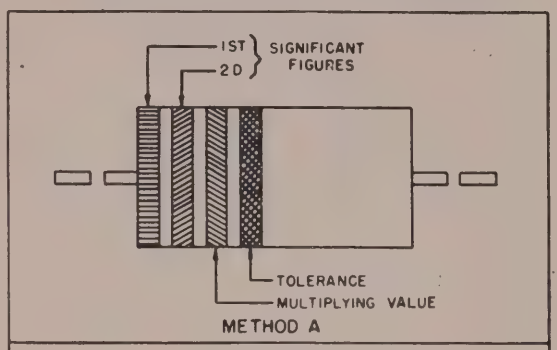
Components	Radio Set AN/GRC-3	Radio Set AN/GRC-5	Radio Set AN/GRC-7	Radio Set AN/GRC-4	Radio Set AN/GRC-6	Radio Set AN/GRC-8	Radio Set AN/VRC-8	Radio Set AN/VRC-9	Radio Set AN/VRC-10	Radio Set AN/VRC-13	Radio Set AN/VRC-14	Radio Set AN/VRC-15	Radio Set AN/VRQ-1	Radio Set AN/VRQ-2	Radio Set AN/VRQ-3	Radio Set AN/VRC-7	Radio Set AN/PRC-16	Intercommunication Set AN/UIC-1	Modification Kit MX-898/GR
Case CY–684/GR	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1			
Case CY–590/GRC																	1		1
Mounting MT–297/GR	1	1	1	1	1	1				1	1	1							
Mounting MT–299/GR							1	1	1										
Mounting MT–298/GR													1	1	1				
Mounting MT–300/GR																1		1	
Mounting MT–673/UR																	1		
Mounting MT–652/GR																	1		1
Receiver-Transmitter RT–66/GRC	1			1			1			1			2						
Receiver-Transmitter RT–67/GRC		1			1			1			1			2					
Receiver-Transmitter RT–68/GRC			1			1			1			1			2				
Receiver-Transmitter RT–70/GRC	1	1	1	1	1	1										1	1		
AF Amplifier AM–65/GRC	1	1	1	1	1	1				1	1	1				1		1	
Power Supply (PP–282/GRC or PP–281/GRC)	2	2	2	1	1	1				1	1	1				1		1	
Power Supply PP–448/GR																1			
Radio Receiver R–108/GRC*	1																		
Radio Receiver R–109/GRC		1																	
Radio Receiver R–110/GRC			1																
Power Supply (PP–109/GR or PP–112/GR)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2				
Control Group AN/GRA–6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Control C–435/GRC	1	1	1	1	1	1							1	1	1				
Control Box C–375/VRC	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		2	
Mast Base AB–15/GR	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	1			
Mast Section MS–116–A	2	2		2	2		2	2		2	2		4	4					

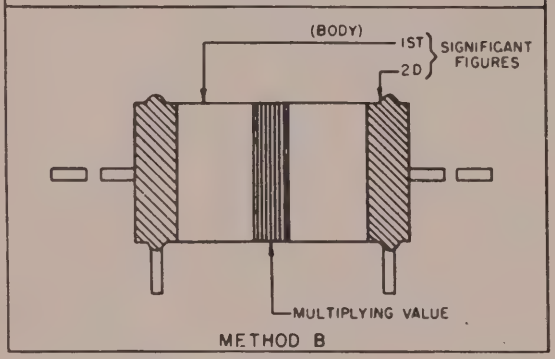
*In 6-volt basic units only.

Components	Radio Set AN/GRC-3	Radio Set AN/GRC-5	Radio Set AN/GRC-7	Radio Set AN/GRC-4	Radio Set AN/GRC-6	Radio Set AN/GRC-8	Radio Set AN/VRC-8	Radio Set AN/VRC-9	Radio Set AN/VRC-10	Radio Set AN/VRC-13	Radio Set AN/VRC-14	Radio Set AN/VRC-15	Radio Set AN/VRQ-1	Radio Set AN/VRQ-2	Radio Set AN/VRQ-3	Radio Set AN/VRC-7	Radio Set AN/PRC-16	Intercommunication Set AN/UIC-1	Modification Kit MX-898/GR
Mast Section MS-117-A	2	2	2	2	2	2	2	2	2	2	2	2	4	4	4	---	---	---	---
Mast Section MS-118-A	2	2	---	2	2	---	2	2	---	2	2	---	4	4	---	---	---	---	---
Mast Section AB-22/GR	2	2	2	2	2	2	---	---	---	---	---	---	---	---	---	2	2	---	1
Mast Section AB-23/GR	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
Mast Section AB-24/GR	2	2	4	2	2	4	---	---	2	---	---	2	---	---	4	2	2	---	1
Power Cable Assembly CX-1209/U	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	---	1
Power Cable Assembly CX-1210/U	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
Bag CW-187/GR	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
Bag CW-188/GR	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
Adapter UG-273/U	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	1	---	---	---
Installation Kit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	---	---	---	---
Wire W-142	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Adapter UG-306/U	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	1	---	---	---
Bag CW-206/GR	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	---	---	---
Connector and Bond Nut (Appl.)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	---	1	---

RESISTOR COLOR CODES

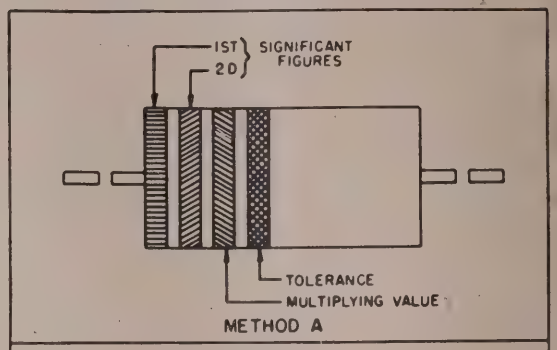
RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS*

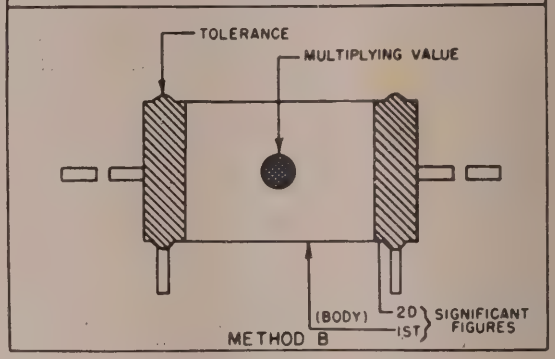




A

JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS†





B

COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)
BLACK	0	1	± –
BROWN	1	10	± 1
RED	2	100	± 2
ORANGE	3	1,000	± 3
YELLOW	4	10,000	± 4
GREEN	5	100,000	± 5
BLUE	6	1,000,000	± 6
VIOLET	7	10,000,000	± 7
GRAY	8	100,000,000	± 8
WHITE	9	1,000,000,000	± 9
GOLD	–	0 1	± 5
SILVER	–	0 01	± 10
NO COLOR	–	–	± 20

NOTES

* INSULATED FIXED COMPOSITION RESISTORS WITH AXIAL LEADS ARE DESIGNATED BY A NATURAL TAN BACKGROUND COLOR NON-INSULATED FIXED COMPOSITION RESISTORS WITH AXIAL LEADS ARE DESIGNATED BY A BLACK BACKGROUND.

† RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED

RMA RADIO MANUFACTURERS ASSOCIATION

JAN JOINT ARMY-NAVY

THESE COLOR CODES GIVE ALL RESISTANCE VALUES IN OHMS

TL 32454S

Figure 33. Resistor color codes.

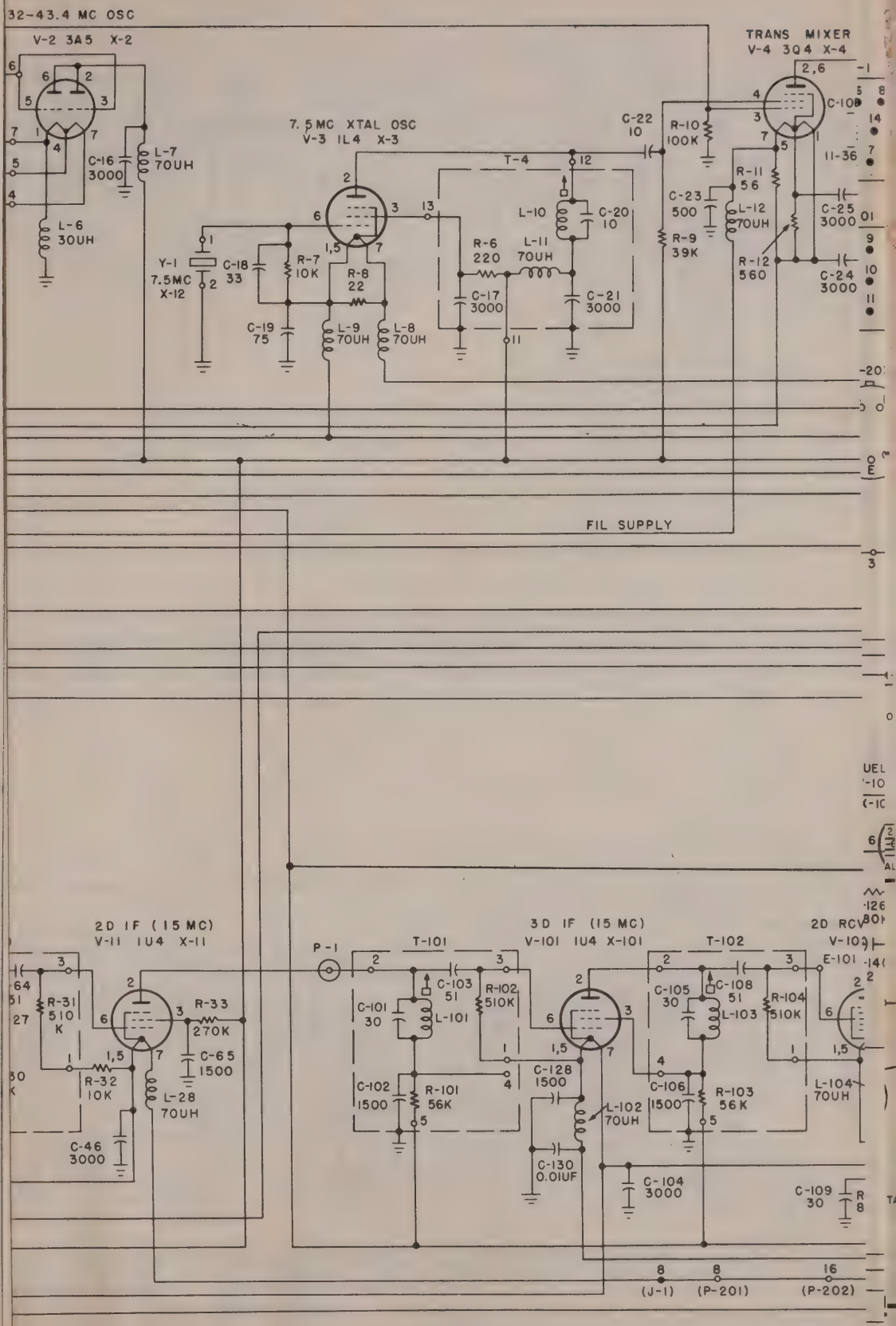
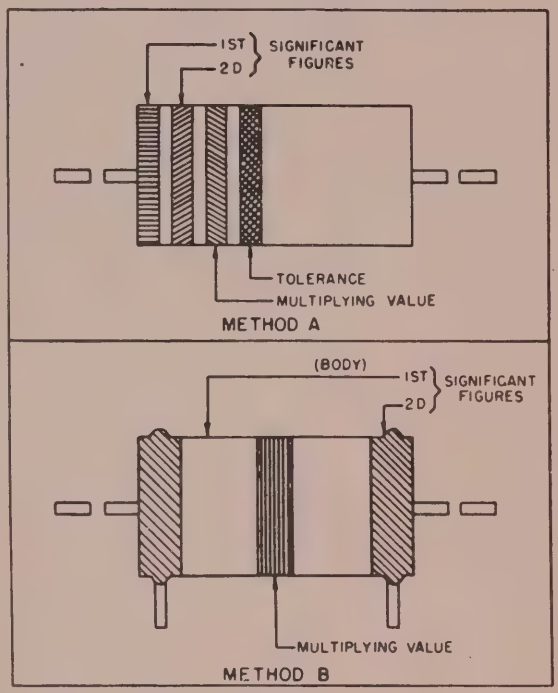


Figure 35. Receiver-

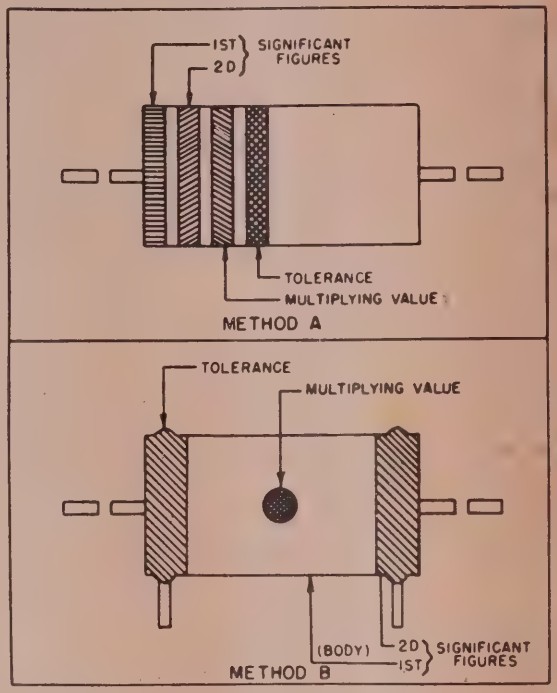
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS*



A

JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS†



B

COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)
BLACK	0	1	± –
BROWN	1	10	± 1
RED	2	100	± 2
ORANGE	3	1,000	± 3
YELLOW	4	10,000	± 4
GREEN	5	100,000	± 5
BLUE	6	1,000,000	± 6
VIOLET	7	10,000,000	± 7
GRAY	8	100,000,000	± 8
WHITE	9	1,000,000,000	± 9
GOLD	–	0 1	± 5
SILVER	–	0 01	± 10
NO COLOR	–	–	± 20

NOTES

* INSULATED FIXED COMPOSITION RESISTORS WITH AXIAL LEADS ARE DESIGNATED BY A NATURAL TAN BACKGROUND COLOR NON-INSULATED FIXED COMPOSITION RESISTORS WITH AXIAL LEADS ARE DESIGNATED BY A BLACK BACKGROUND.

† RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED

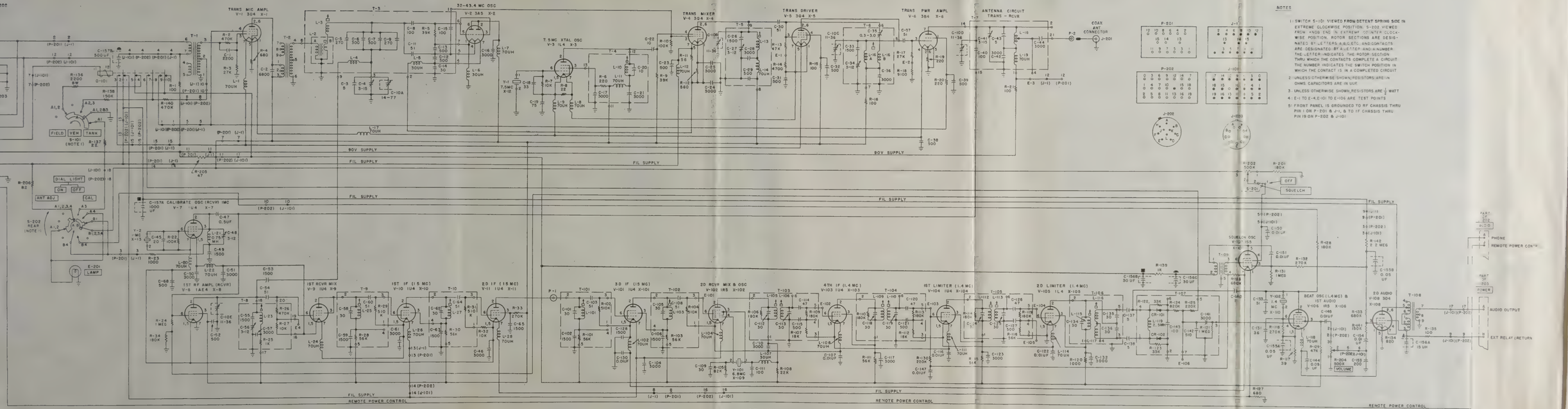
RMA RADIO MANUFACTURERS ASSOCIATION

JAN JOINT ARMY-NAVY

THESE COLOR CODES GIVE ALL RESISTANCE VALUES IN OHMS

TL 32454

Figure 33. Resistor color codes.


PART OF J-202
AUDIO
MIC (IN)
TRANSMIT CONTROL
GROUND
PART OF J-203
POWER
MIC (IN)
TRANSMIT CONTROL
RELAY SUPPLY
90V SUPPLY
FIL SUPPLY
GROUND
REMOTE POWER CONTROL
TRANS MIC AMPL V-1 3Q4 X-1
32-43.4 MC OSC V-2 3A5 X-2
7.5 MC XTAL OSC V-3 1L4 X-3
TRANS MIXER V-4 3Q4 X-4
TRANS DRIVER V-5 3Q4 X-5
TRANS PWR AMPL V-6 3B4 X-6
ANTENNA CIRCUIT TRANS - RCVR
COAX ANT CONNECTOR
J-201
P-201
P-202
J-101
J-102
J-203
P-203
P-204
P-205
P-206
P-207
P-208
P-209
P-210
P-211
P-212
P-213
P-214
P-215
P-216
P-217
P-218
P-219
P-220
P-221
P-222
P-223
P-224
P-225
P-226
P-227
P-228
P-229
P-230
P-231
P-232
P-233
P-234
P-235
P-236
P-237
P-238
P-239
P-240
P-241
P-242

NOTES

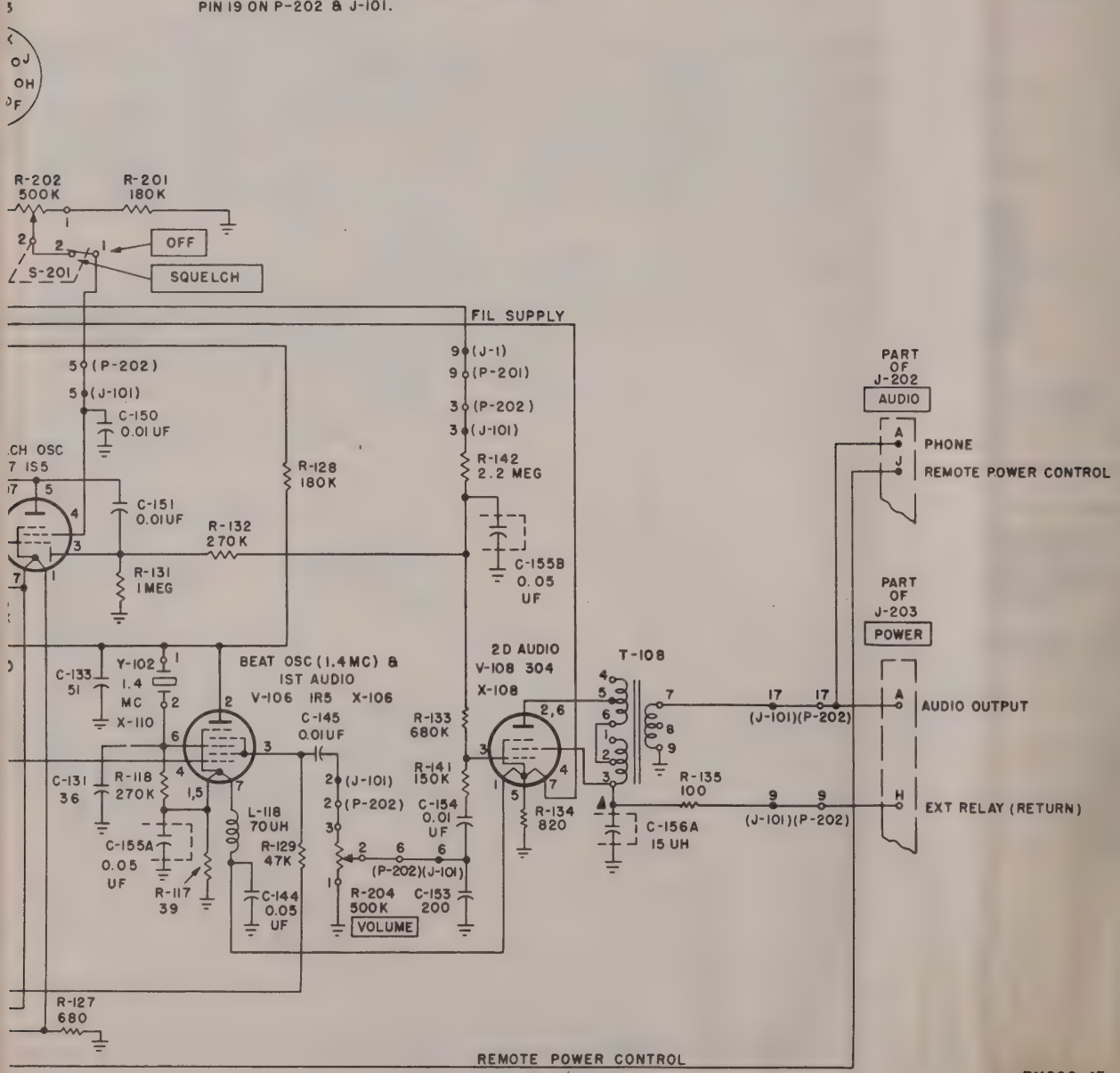
1: SWITCH S-101 VIEWED FROM DETENT SPRING SIDE IN EXTREME CLOCKWISE POSITION. S-202 VIEWED FROM KNOB END IN EXTREME COUNTER CLOCKWISE POSITION. ROTOR SECTIONS ARE DESIGNATED BY LETTERS A,B,C,ETC., AND CONTACTS ARE DESIGNATED BY A LETTER AND A NUMBER. THE LETTER INDICATES THE ROTOR SECTION THRU WHICH THE CONTACTS COMPLETE A CIRCUIT. THE NUMBER INDICATES THE SWITCH POSITION IN WHICH THE CONTACT IS IN A COMPLETED CIRCUIT.

2: UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS. CAPACITORS ARE IN UUF.

3: UNLESS OTHERWISE SHOWN, RESISTORS ARE $\frac{1}{2}$ WATT.

4: E-1 TO E-4, E-101 TO E-106 ARE TEST POINTS.

5: FRONT PANEL IS GROUNDED TO RF CHASSIS THRU PIN 1 ON P-201 & J-1, & TO IF CHASSIS THRU PIN 19 ON P-202 & J-101.



TM290-47

NOTES

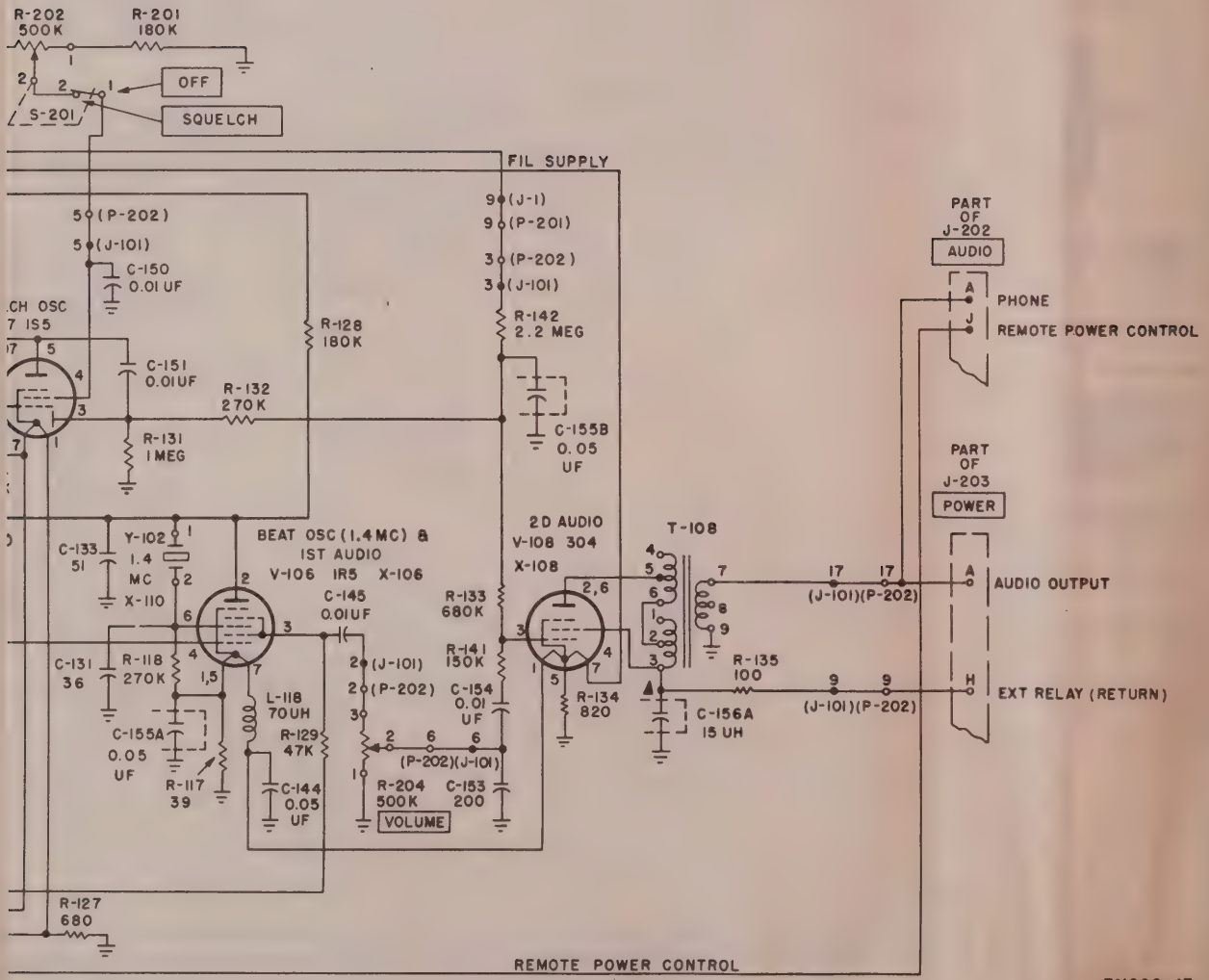
1: SWITCH S-101 VIEWED FROM DETENT SPRING SIDE IN EXTREME CLOCKWISE POSITION. S-202 VIEWED FROM KNOB END IN EXTREME COUNTER CLOCKWISE POSITION. ROTOR SECTIONS ARE DESIGNATED BY LETTERS A,B,C,ETC., AND CONTACTS ARE DESIGNATED BY A LETTER AND A NUMBER. THE LETTER INDICATES THE ROTOR SECTION THRU WHICH THE CONTACTS COMPLETE A CIRCUIT. THE NUMBER INDICATES THE SWITCH POSITION IN WHICH THE CONTACT IS IN A COMPLETED CIRCUIT.

2: UNLESS OTHERWISE SHOWN, RESISTORS ARE IN OHMS. CAPACITORS ARE IN UUF.

3: UNLESS OTHERWISE SHOWN, RESISTORS ARE $\frac{1}{2}$ WATT.

4: E-1 TO E-4, E-101 TO E-106 ARE TEST POINTS.

5: FRONT PANEL IS GROUNDED TO RF CHASSIS THRU PIN 1 ON P-201 & J-1, & TO IF CHASSIS THRU PIN 19 ON P-202 & J-101.



TM290-47

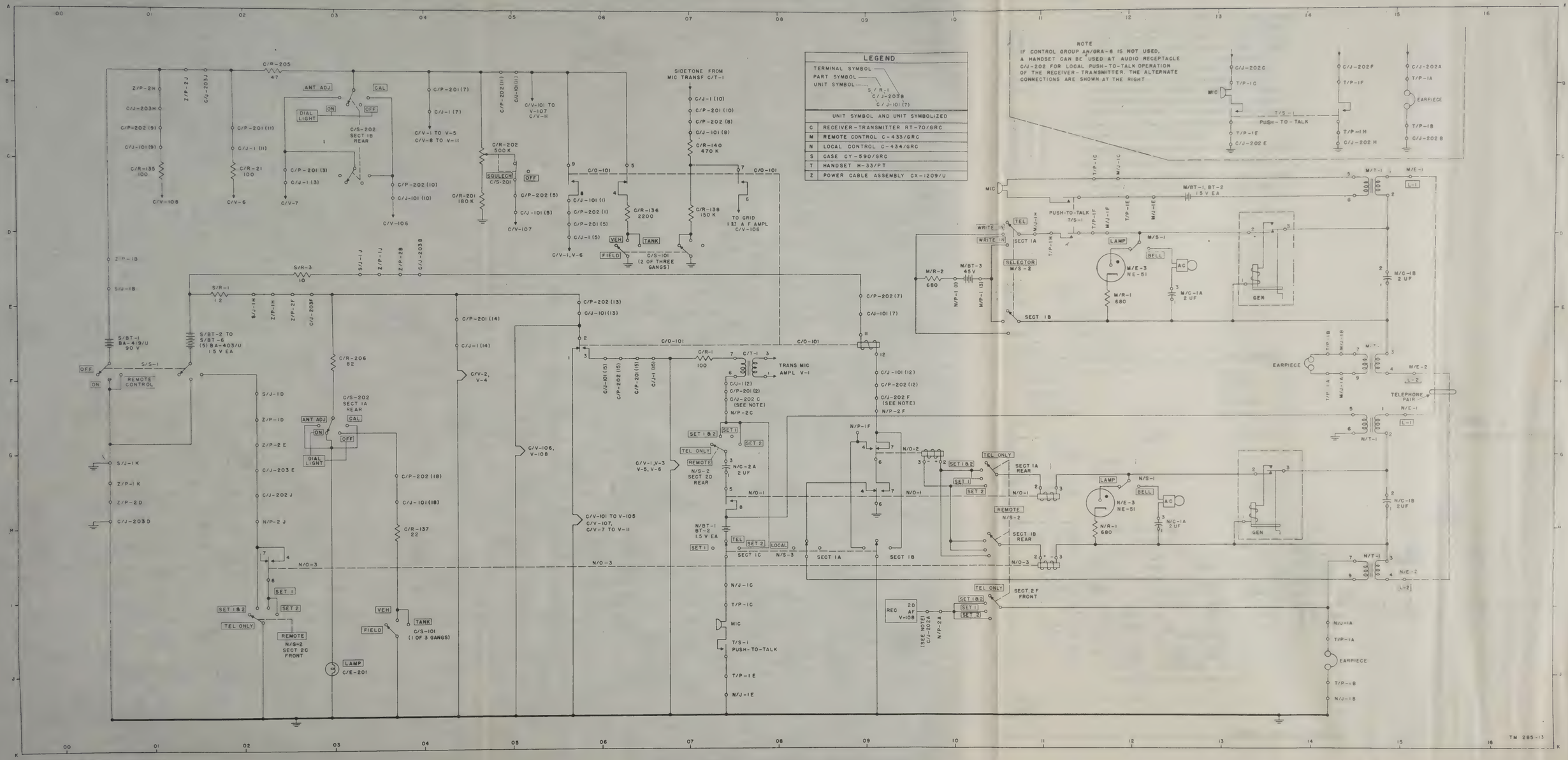
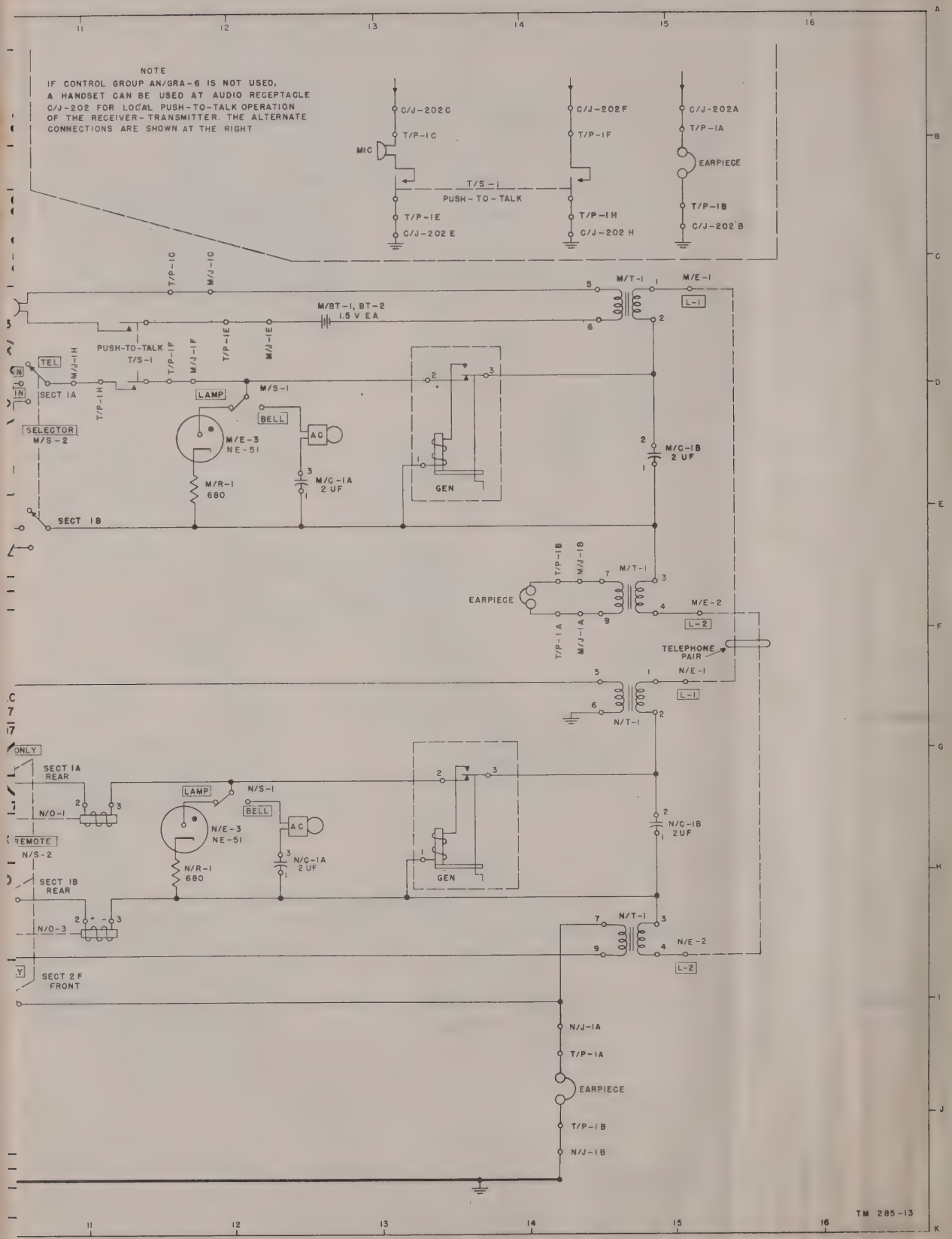
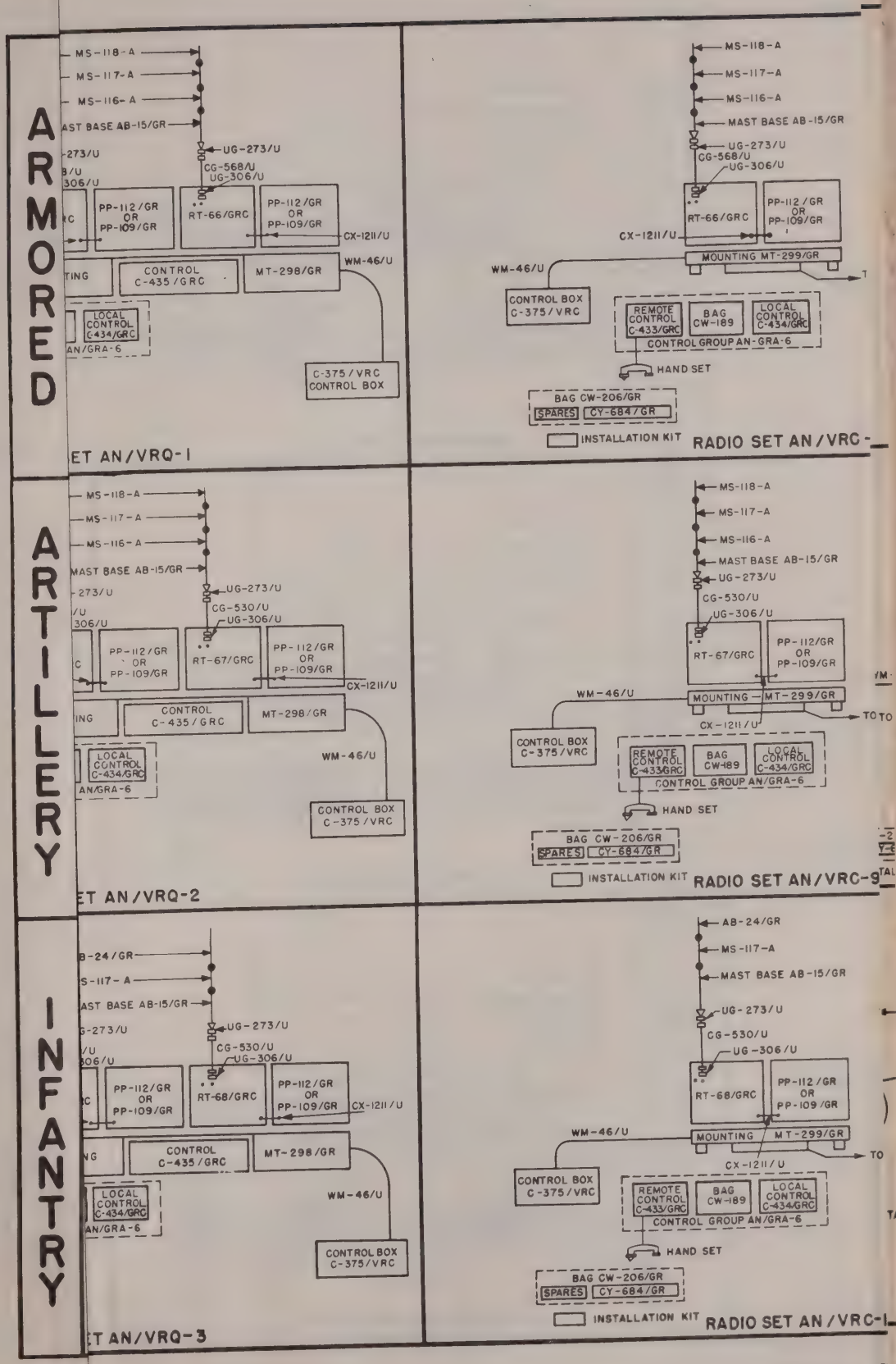


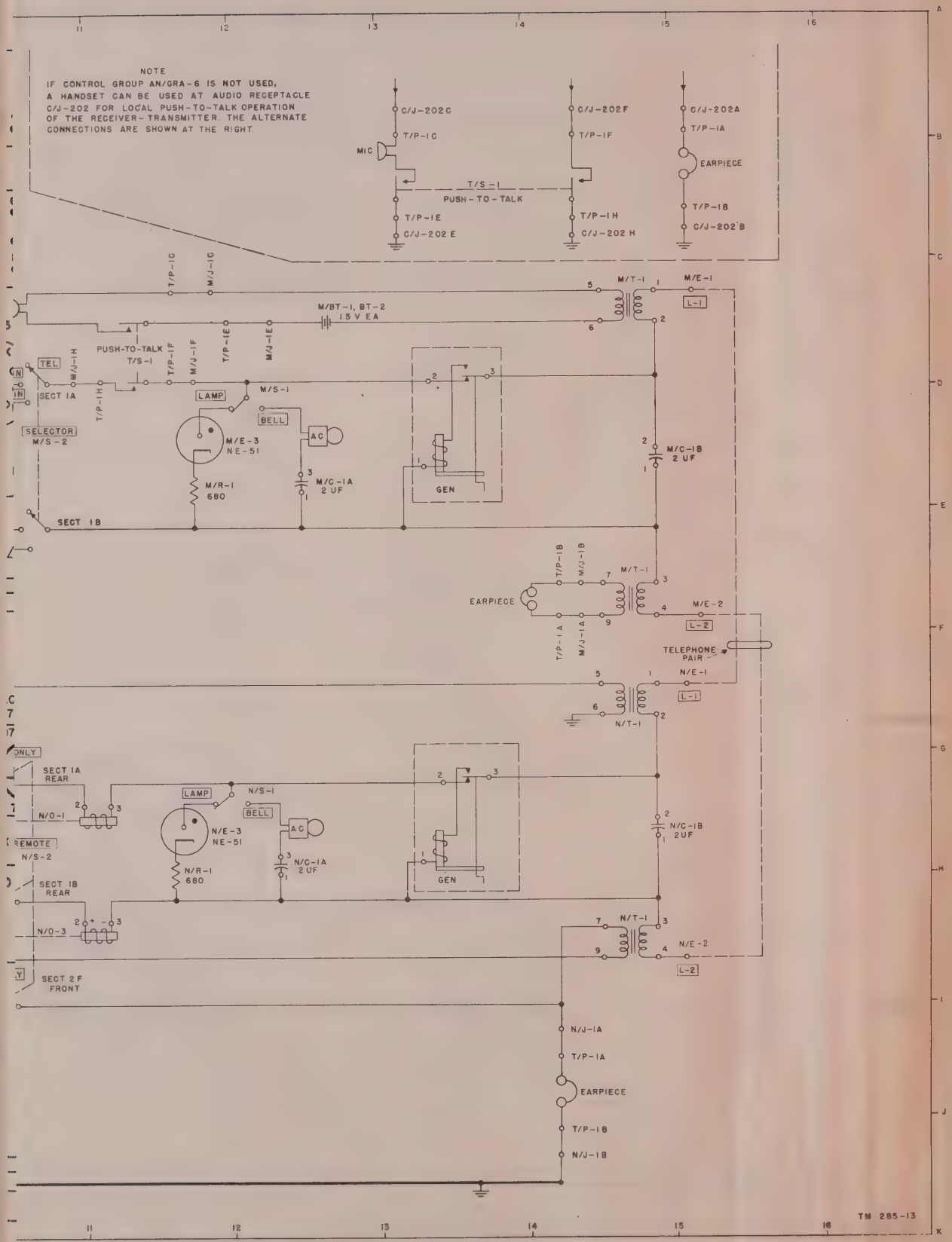
Figure 36. Power distribution and control circuits.


NOTE
IF CONTROL GROUP AN/GRA-6 IS NOT USED, A HANDSET CAN BE USED AT AUDIO RECEPTACLE C/J-202 FOR LOCAL PUSH-TO-TALK OPERATION OF THE RECEIVER-TRANSMITTER. THE ALTERNATE CONNECTIONS ARE SHOWN AT THE RIGHT
C/J-202C
T/P-1C
MIC
T/S-1
PUSH-TO-TALK
T/P-1E
C/J-202E
C/J-202F
T/P-1F
T/P-1H
C/J-202H
C/J-202A
T/P-1A
EARPIECE
T/P-1B
C/J-202B
M/T-1
M/E-1
L-1
M/BT-1, BT-2
1.5 V EA
PUSH-TO-TALK T/S-1
TEL
SECT 1A
SELECTOR M/S-2
SECT 1B
LAMP
BELL
M/S-1
M/E-3 NE-51
M/R-1 680
AC
M/C-1A 2 UF
GEN
M/C-1B 2 UF
EARPIECE
M/E-2
L-2
TELEPHONE PAIR
N/E-1
N/T-1
ONLY
SECT 1A REAR
N/O-1
REMOTE
N/S-2
SECT 1B REAR
N/O-3
SECT 2F FRONT
N/S-1
N/E-3 NE-51
N/R-1 680
N/C-1A 2UF
N/C-1B 2UF
N/J-1A
T/P-1A
EARPIECE
T/P-1B
N/J-1B
TM 285-13



939488

Figure 37. S


NOTE
IF CONTROL GROUP AN/GRA-6 IS NOT USED, A HANDSET CAN BE USED AT AUDIO RECEPTACLE C/J-202 FOR LOCAL PUSH-TO-TALK OPERATION OF THE RECEIVER-TRANSMITTER. THE ALTERNATE CONNECTIONS ARE SHOWN AT THE RIGHT.
C/J-202C
T/P-1C
MIC
T/S-1
PUSH-TO-TALK
T/P-1E
C/J-202E
C/J-202F
T/P-1F
T/P-1H
C/J-202H
C/J-202A
T/P-1A
EARPIECE
T/P-1B
C/J-202B
M/T-1
M/E-1
L-1
M/BT-1, BT-2
1.5 V EA
PUSH-TO-TALK
T/S-1
TEL
SECT 1A
SELECTOR
M/S-2
LAMP
M/S-1
BELL
AC
M/E-3
NE-51
M/R-1
680
M/C-1A
2 UF
GEN
M/C-1B
2 UF
SECT 1B
EARPIECE
M/E-2
L-2
TELEPHONE PAIR
N/E-1
N/T-1
ONLY
SECT 1A REAR
N/O-1
N/S-1
N/E-3
NE-51
N/R-1
680
N/C-1A
2 UF
N/C-1B
2 UF
REMOTE
N/S-2
SECT 1B REAR
N/O-3
SECT 2F FRONT
N/J-1A
T/P-1A
EARPIECE
T/P-1B
N/J-1B
TM 285-13

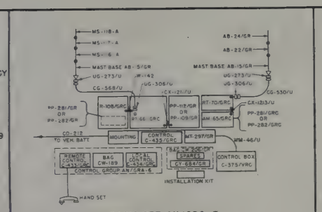
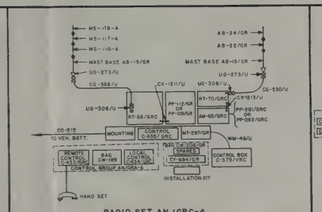
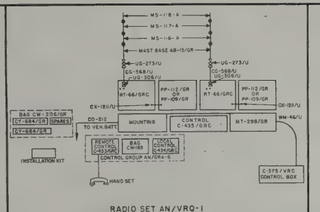
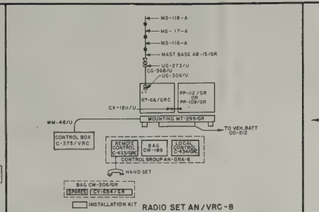
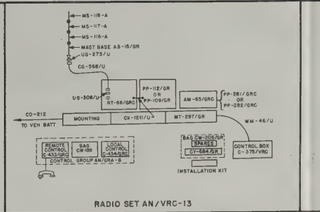
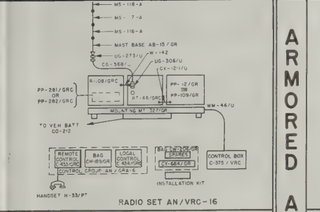
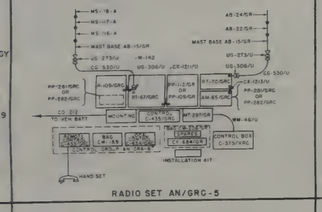
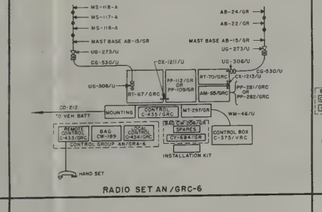
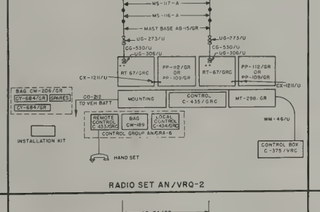
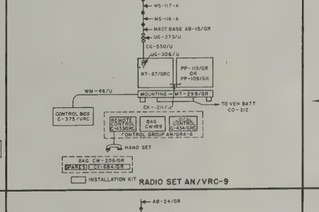
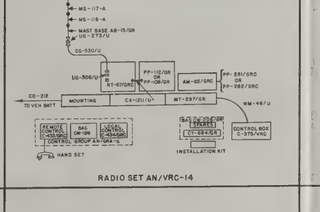
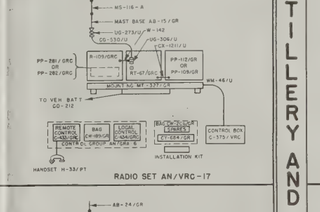
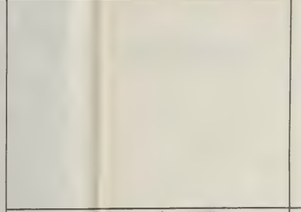
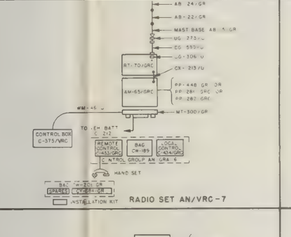
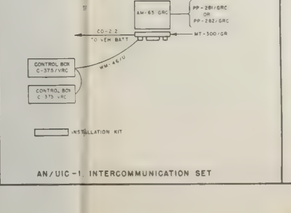
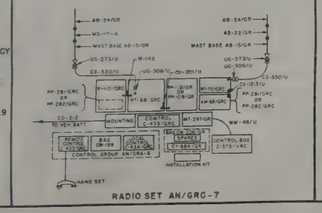
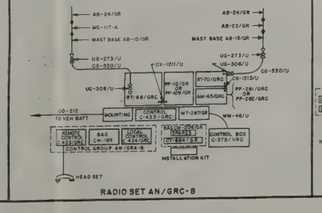
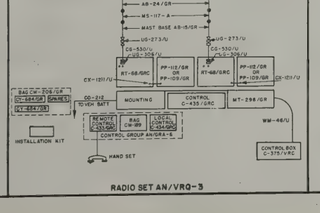
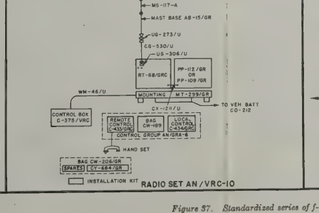
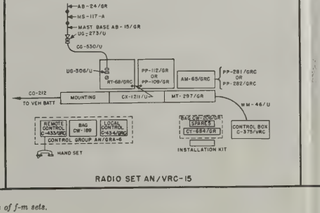
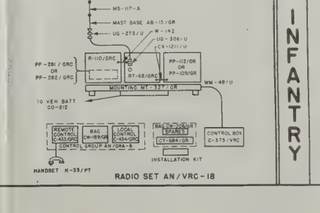
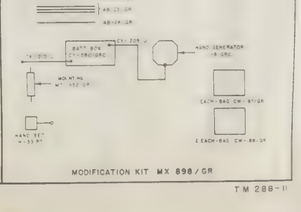
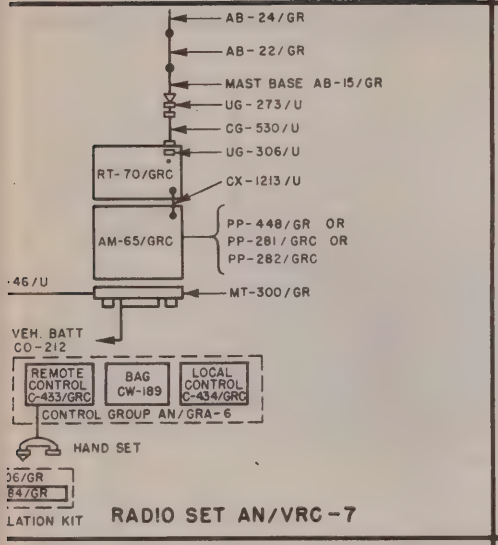
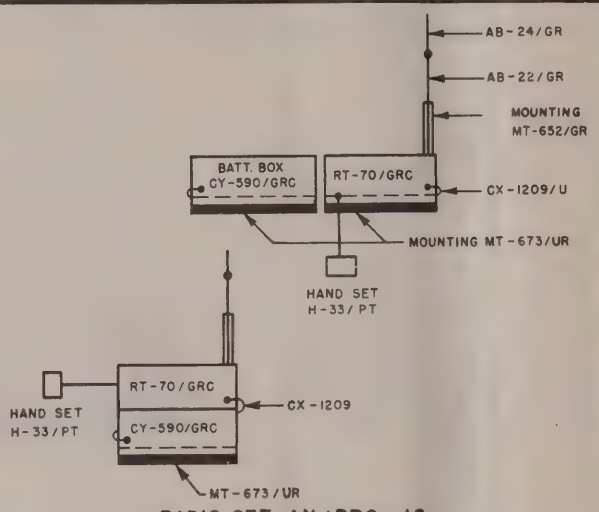
ARMORED	FREQUENCY RANGE 20.0 - 27.9 MCS							ARMORED ARTILLERY AND INFANTRY
		RADIO SET AN/GRC-3	RADIO SET AN/GRC-4	RADIO SET AN/VRC-1	RADIO SET AN/VRC-8	RADIO SET AN/VRC-13	RADIO SET AN/VRC-16	
ARTILLERY	FREQUENCY RANGE 27.0 - 38.9 MCS							  
		RADIO SET AN/GRC-5	RADIO SET AN/GRC-6	RADIO SET AN/VRQ-2	RADIO SET AN/VRC-9	RADIO SET AN/VRC-14	RADIO SET AN/VRC-17	RADIO SET AN/VRC-7
INFANTRY	FREQUENCY RANGE 38.0 - 54.9 MCS							
		RADIO SET AN/GRC-7	RADIO SET AN/GRC-8	RADIO SET AN/VRQ-3	RADIO SET AN/VRC-10	RADIO SET AN/VRC-15	RADIO SET AN/VRC-18	AN/UIC-1 INTERCOMMUNICATION SET

Figure 37. Standardized series of f-m sets.

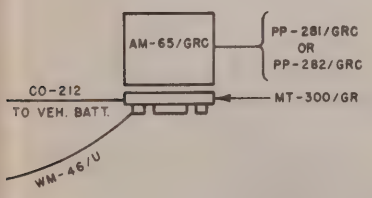
253488 O - 51 (Face page 61) No. 3



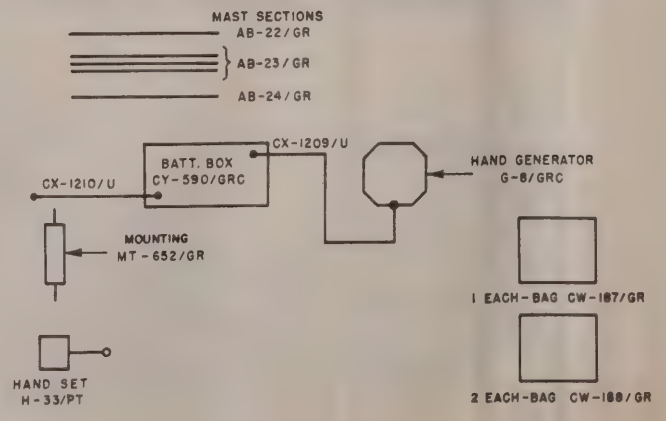
RADIO SET AN/VRC-7



RADIO SET AN/PRC-16

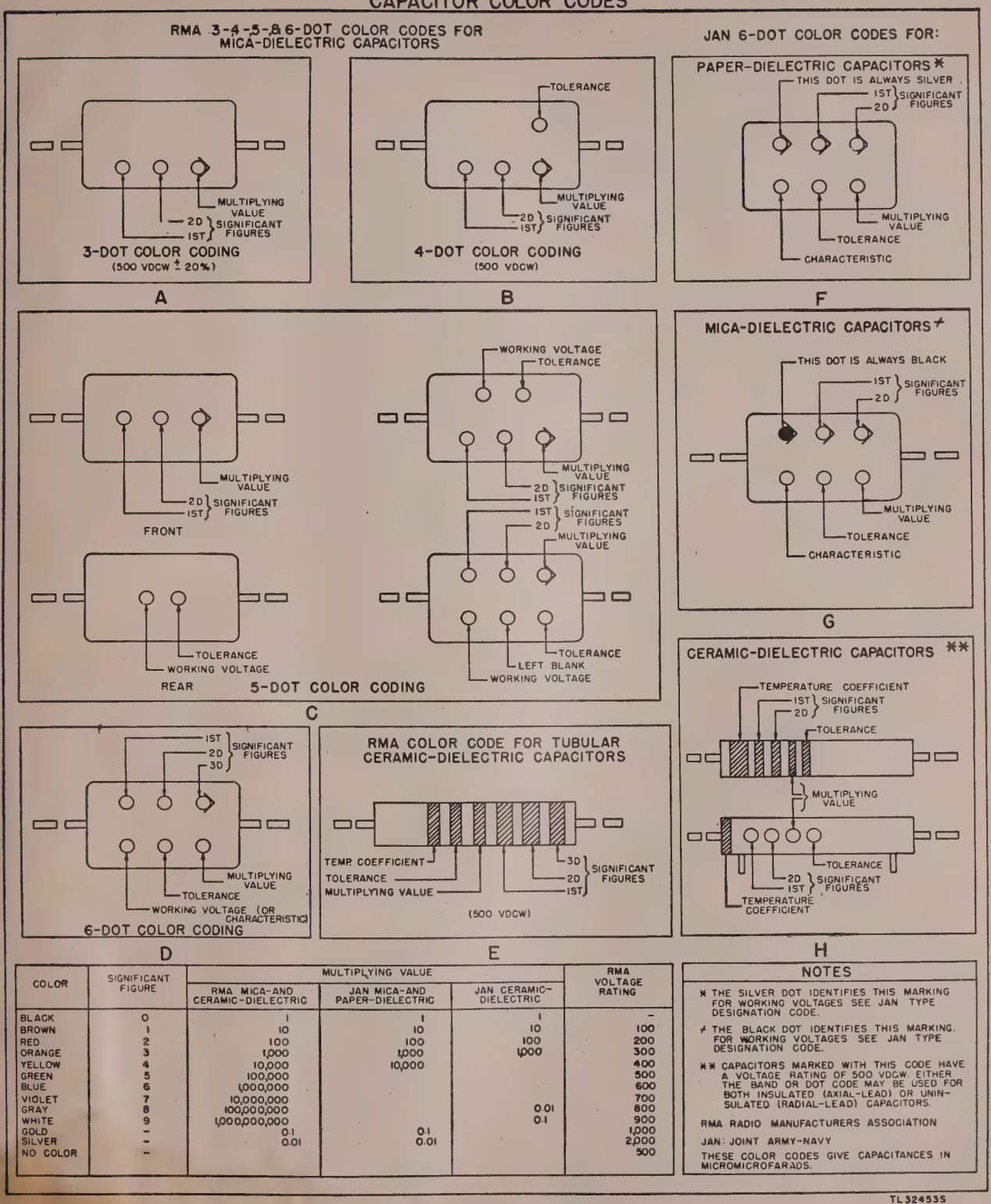


INTERCOMMUNICATION SET



MODIFICATION KIT MX 898/GR

CAPACITOR COLOR CODES



COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE			RMA VOLTAGE RATING
		RMA MICA-AND CERAMIC-DIELECTRIC	JAN MICA-AND PAPER-DIELECTRIC	JAN CERAMIC-DIELECTRIC	
BLACK	0	1	1	1	-
BROWN	1	10	10	10	100
RED	2	100	100	100	200
ORANGE	3	1,000	1,000	1,000	300
YELLOW	4	10,000	10,000		400
GREEN	5	100,000			500
BLUE	6	1,000,000			600
VIOLET	7	10,000,000			700
GRAY	8	100,000,000		0.01	800
WHITE	9	1,000,000,000		0.1	900
GOLD	-	0.1	0.1		1,000
SILVER	-	0.01	0.01		2,000
NO COLOR	-				500

NOTES

* THE SILVER DOT IDENTIFIES THIS MARKING FOR WORKING VOLTAGES SEE JAN TYPE DESIGNATION CODE.

≠ THE BLACK DOT IDENTIFIES THIS MARKING. FOR WORKING VOLTAGES SEE JAN TYPE DESIGNATION CODE.

** CAPACITORS MARKED WITH THIS CODE HAVE A VOLTAGE RATING OF 500 VDCW. EITHER THE BAND OR DOT CODE MAY BE USED FOR BOTH INSULATED (AXIAL-LEAD) OR UNINSULATED (RADIAL-LEAD) CAPACITORS.

RMA: RADIO MANUFACTURERS ASSOCIATION

JAN: JOINT army-navy

THESE COLOR CODES GIVE CAPACITANCES IN MICROMICROFARADS.

TL 32453S

Figure 34. Capacitor color codes.

INDEX

	Paragraph	Page
Adjustments for operation	26	13
Antenna Mast Sections AB–22/GR and AB–24/GR:		
Description	11*f*	6
Installation	15*h*	8
Auxiliary equipment, definition of	52	31
Basic system block diagram	34	16
Case CY–590/GRC:		
Controls	25	13
Description	10	4
Replacement of parts	51	28
Unit theory	44	19
Characteristics, data	5	3
Chest Set Group AN/GSA–6:		
Description	61	43
Installation and operation	62	46
Purpose	60	43
Checklist, equipment performance	47	24
Components, table of	6	3
Major	86	
Minor	11	6
Control Group AN/GRA–6:		
Controls and facilities	56	37
Description	53	33
Installation	54	35
Local push-to-talk operation	57	38
Local push-to-talk operation, theory of	58	41
Maintenance, organizational	59	43
Operating procedures	57	38
Operation, modes of	55	36
Operation, theory of	58	41
Purpose and use	52	31
Remote push-to-talk operations, theory of	58	41
Theory of operation	58	41
Controls and instruments:		
Case CY–590/GRC	25	13
Control Group AN/GRA–6	56	37
Receiver-Transmitter RT–70/GRC	24	12
Demolition	65	52
Disassembly of Radio Set AN/PRC–16	63	51
Distribution, methods of	66	52
Equipment performance checklist	47	24
Equipment, purpose of	4	1
Forms and records	3	1
Grid coordinate system	35*b*	17
Handset H–33/PT, description of	11*e*	6
Headset-Microphone H–63/U:		
Description	61	43
Installation and operation	62	46
Purpose	60	43
Horizontal installation	16	10
Installation:		
General	13	8
Horizontal arrangement	16	10
Unpacking	14	8
Vertical arrangement	15	8
Local Control C–434/GRC:		
Description	53	33
Installation	54	35
Localizing procedures	59	43
Localizing procedures	47	24
Major components	86	
Minor components, listing of	11	6
Monitoring:		
Operation from Control Group AN/GRA–6	58	41
Operation, modes of	21	12
Operation, theory of	39	13
Operational procedure	31	15
Mounting MT–652/GR, description of	11*c*	6
Mounting MT–673/UR, description of	115	
Nomenclature	2	1
Operation, mode of:		
Monitoring	21	12
Push-to-talk	22	12
Operational procedures	30	15
Packaging data	7	3
Performance checklist, equipment	47	24
Plate and screen supply	38	18
Power Cable Assembly CX–1209/U, use of	11	6
Power distribution:		
Input	36	18
Receiver filaments	37	18
Receiver plate and screen	38	18
Purpose of equipment	4	1
Push-to-talk operation:		
Local, from AN/GRA–6, theory	58	41
Modes	22	12
Procedure	31	15
Remote, theory	52	31
Presetting detented channels	29	14
Receiver-Transmitter RT–70/GRC:		
Antenna tuning	17	10
Controls and instruments	24	12
Description	9	4
Installation	15	8
Nomenclature	2*b*	1
Presetting detented channels	29	14
Relay operation	41	19
Transmit controls, theory	40	19
Transmitter signal path	42	19
Tuning	28	14
Unit theory	45	20

	Paragraph	Page
Records	3	1
Remote Control C–433/GRC:		
Controls and facilities	56	37
Description	53	33
Installation	54	35
Removing immersionproof cases	49	24
Repacking for shipment or limited storage	64	51
Replacement of parts:		
Control Group AN/GRA–6	51	28
Immersionproof case, removal of	49	24
Receiver-Transmitter RT–70/GRC	55	36
Running spares, listing of	12	6
Spare parts	12	6
Squelch adjustment, operation of	27	13
Starting procedures	26	13
Stopping procedure	32	15
System:		
Diagram and legend	35	17
General description	8	4
Theory of operation	33	16
Table:		
Components, table I	6	3
Table—Continued		
Equipment performance checklist, table III	47	24
Packing box contents, table II	7	3
Technical characteristics, data	5	3
Theory of operation	33	16
Transmit controls, theory of	40	19
Transmitter signal path, theory of	42	19
Trouble shooting:		
Control Group AN/GRA–6	59	43
Equipment performance checklist	47	24
Receiver-Transmitter RT–70/GRC	47	24
Scope	46	24
Tuning:		
Presetting detented channels	29	14
Receiver-Transmitter RT–70/GRC	28	14
Unit theory:		
Case CY–590/GRC	44	19
Receiver-Transmitter RT–70/GRC	45	20
Scope	43	19
Unpacking instructions, general	14	8
Vertical installation	15	8
Volume-level adjustment, operation of	27	13